

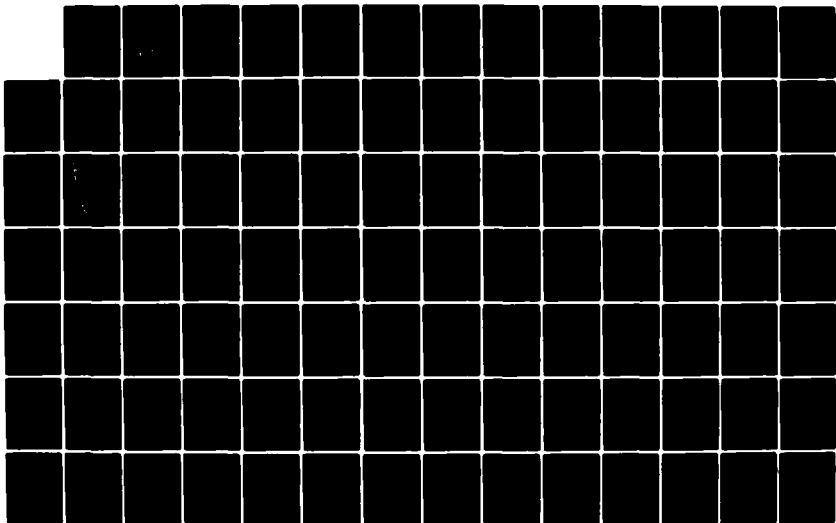
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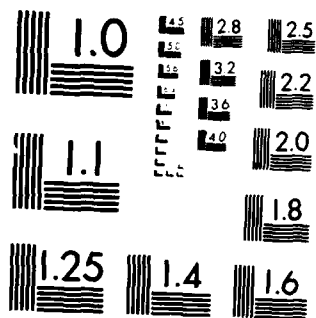
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THE HAW RIVER SITES

VOLUME I



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ARCHEOLOGICAL INVESTIGATIONS
AT TWO STRATIFIED SITES
IN THE NORTH CAROLINA PIEDMONT

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THE HAW RIVER SITES:
ARCHEOLOGICAL INVESTIGATIONS AT TWO
STRATIFIED SITES IN THE NORTH
CAROLINA PIEDMONT

VOLUME I

STEPHEN R. CLAGGETT AND JOHN S. CABLE,
ASSEMBLERS

UNDER THE SUPERVISION OF

CURTIS E. LARSEN, Ph.D.

PRINCIPAL INVESTIGATOR

Curtis E. Larsen

1982

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ABSTRACT

Archeological salvage excavations were conducted in central North Carolina during the fall of 1979 at prehistoric sites called the Haw River group. Initial survey and test excavations at 31Ch8, 31Ch29 and 31Ch28 demonstrated that the two former sites contained deeply-stratified deposits with artifactual remains representing some 10,000 years of prehistory. Impressed by the potential significance of the sites, archeologists from Commonwealth Associates Inc. presented a data recovery research design to the Wilmington District Army Corps of Engineers which was negotiated and implemented as Contract DACW54-79-C-0052.

Fieldwork at 31Ch8 and 31Ch29 included detailed surface mapping, test pitting and complete excavation of two large-scale block units. Due to the extreme complexity of natural and cultural stratigraphic processes at the sites, a program of geomorphological testing and evaluation was made an integral part of the archeological investigations.

The report resulting from the 1979 Haw River excavation details methodological aspects of the project, including field data recovery techniques and laboratory analysis procedures. A history of previous investigations is provided, as is an updated archeological background section; both are included to assist the reader in understanding the archeological and interpretive contexts of our work. Major portions of the report detail the innovative theoretical framework within which the Haw River site data are presented and interpreted. Sections are devoted to reconstruction of paleoenvironmental variables that affected natural site formation processes. Environmental models also are used to explain discerned patterns of lithic technological organization. Observed variations in prehistoric technologies from late Paleo-Indian through Woodland times are used to test the model. The entire study represents an attempt to develop a body of middle range theoretical concepts, using general ecological theory, which can explain rather than merely describe human and environmental interactions in the Southeast.

NON-TECHNICAL SUMMARY

This report presents in a very detailed manner the archeological excavations and analysis of materials from two prehistoric Indian sites in Chatham County, North Carolina. The sites are located on the banks of the Haw River, a major tributary of the Cape Fear River, and are only two of over 350 such archeological sites affected by construction of the B. Everett Jordan Dam and Lake. Archeologists from Commonwealth Associates Inc., a private engineering/consulting firm in Michigan, performed this work from 1979 through 1981 under the terms of a contract administered by the U.S. Army Corps of Engineers for the preservation of cultural resource data.

The Haw River sites are numbered 31Ch8 and 31Ch29 in the North Carolina state archeological site file system. They have been known to amateur and professional archeologists for many years, but it was not until very recently that their significance as important sources of scientific and historical information was recognized. Application of both traditional and new techniques of archeological excavation and interpretation has demonstrated that series of human occupations occurred at the Haw River sites for at least the last 10,000 to 11,000 years. Superimposed layers of stone tools, broken ceramics and other non-perishable items have been revealed as preserved in alluvially-deposited sands of the Haw River which measure some 2 meters (6.6 feet) in average depth. Successive groups of prehistoric American Indians lived at the Haw River sites, leaving such evidence of their culture as was eventually sealed in the earth until exposed by Commonwealth archeologists thousands of years later. The results of those modern activities occupied 25 people for 4 months to excavate selected portions of the sites; another two years were spent in the lab and in writing by another dozen researchers before this report could be considered finished.

The scientific findings of the project researchers are presented as several chapters within the report. The first several chapters discuss the history of the project and B. Everett Jordan archeology in general, current knowledge of prehistoric archeology elsewhere in the Southeast, and a summary of the environment of the Haw River region. Those background chapters provide the reader with necessary information for understanding exactly how our work progressed and, at least partially, the importance of the Haw River sites in relation to others in the Piedmont and eastern United States.

A subsequent chapter details the methods used to excavate the sites and analyze the recovered artifacts. Attention is focused on precise recording techniques, involving detailed horizontal and vertical measurement and mapping of artifact locations in the ground. Laboratory techniques discussed include measurement of various attributes of stone tools or ceramic pot sherds, comparisons with existing typologies and analysis of temporal and/or spatial patterns of those items.

All field and laboratory activities, laborious as they seem, are necessary to guarantee that a maximum amount of information is gathered to contribute to the solution of archeological research problems also outlined in the report. A chapter on geological interpretations of the sites and their natural and cultural deposits is included to help us unravel the complex interaction of human and environmental forces at the Haw River sites. By examining the physical characteristics of the river floodplain and terrace system, we can better understand how the sites were formed, as well as the nature of climatic and ecological conditions that affected aboriginal inhabitants of those sites.

Later chapters in the report present in great detail our findings on the artifacts and other physical characteristics of the Haw River sites. Several aspects of the stone tools and ceramic vessels found at the sites are discussed, as substantiated through exhaustive study of metric and other attributes measured on each of thousands of recovered specimens. Physical dimensions such as length, width and thickness of artifacts are compared to form inclusive classes of tools. Other characteristics are used to infer functions of tools within those classes or types and their methods of manufacture, maintenance and discard. Tool types are compared with similar specimens at other archeological sites to help determine the relative ages of specimens and the cultural groups they represent.

More important than the simple measuring and cataloging of artifacts discussed in this report are the more elusive types of knowledge having to do with the overall operations of prehistoric cultural systems. The shapes and physical arrangements of inanimate objects like stone knives, scrapers or pottery sherds help substantiate our perceptions of how successive Indian groups differed in terms of material culture. This report, in keeping with current goals of archeological theory, attempts to get at exactly how those groups operated in response to environmental conditions of rainfall, temperature, vegetation and exploitable animal life. To that end, we have developed a model based on general ecological theory and bolstered with modern ethnographic studies. The model explores differences in archeological remains in terms of how human groups respond to their environments by varying the size of operating social groups and the relative mobility of those groups so as to most efficiently provide for basic needs of food, shelter and water.

The model around which this report is structured concentrates on how archeological specimens can be used to infer how extinct Indian groups operated in the North Carolina Piedmont over the last 10,000 to 11,000 years. Evidence is provided from other scientific studies of climate and vegetation which suggests that very real changes in temperature, precipitation, plants and animal populations have occurred during that time.

The earliest Indians to occupy the Haw River sites, and North America in general, lived within a very different environment from that of today. Yearly cycles of cooler temperatures and increased rainfall at the end of the Pleistocene "Ice Age" made their world quite different from ours. Archeological evidence suggests that the PaleoIndians (as archeologists call them) lived in small family groups and lived by hunting wild game, particularly whitetail deer, and gathering available nuts (hickory, acorn), roots and other plant foods.

Later prehistoric groups called Archaic people continued similar patterns of hunting and gathering during the years from approximately 8000 to 2000 B.C. But important changes in climate, vegetation and animal populations occurred during those times that, according to archeological models like the one presented in this report, profoundly affected how people lived. A major shift in the earth's temperature and precipitation patterns around 8000 to 6000 B.C. can be identified, which hypothetically caused American Indian groups in the Southeast to concentrate less on game animals as major food sources and more on foraged items like plant foods, shellfish and the like. By later Archaic times (ca. 2000-1000 B.C.), groups had become so adept at efficiently exploiting all niches of their environment that they became less mobile in their food searches. Population increases resulted, group territories were identified and the beginnings of interregional trade began.

The subsequent Woodland stage (ca. 1000 B.C. to A.D. 1600) in North Carolina is characterized by the archeological recovery of ceramic vessels, concentrated village refuse deposits and evidence for cultivated foods (maize, squash) in addition to gathered wild foods. New political organizations have been inferred by archeologists for this period; no doubt important beginnings for later, historically-named tribes may be found in the Woodland stage occupations of sites like the Haw River group.

The Haw River excavations, analyses and report represent one of the largest archeological projects ever undertaken in North Carolina. As an example of the use of public funds to salvage data on prehistoric cultural resources, these efforts embody novel and very important applications of scientific archeological techniques to the interpretation of human cultural remains. Beyond the recovery of many thousands of archeological specimens, the Haw River project will contribute significantly to our understanding of human behavior patterns. Application of up-to-date techniques of statistical analysis, geological interpretation and anthropological study to these archeological sites helps advance our understanding of ecological causes and effects. The time depth afforded by the Haw River sites has permitted the monitoring of several significant, long-term changes in ecological relationships and the human technological and social means for coping with those changes.

FOREWORD

My introduction to the Haw River archeological sites discussed in this report closely followed the completion of excavations at another Early Archaic site in Virginia. My experience at this Potomac River valley site had been positive and the excavation had produced a significant scientific record that promised to add a great amount of new material and interpretation to Middle Atlantic and Southeastern archeology. My attitude toward the Haw River sites was frankly rather biased. By all previous accounts these sites seemed to represent a series of potentially disturbed and redeposited artifacts. My first impressions were reinforced when I arrived at the site area along the floodplain. All vegetation had recently been cleared from the floodpool of the B. Everett Jordan Reservoir. The view was one of desolation and certainly not aesthetically appealing. Stephen Claggett, John Cable, and Lisa Novick were actively surveying and sampling the surface of the exposed floodplain as a part of the phase I evaluation of the area. My role was not yet that of principal investigator for the project. I was simply to be involved with deep testing the project area with the aid of a backhoe to unravel the depositional history of the various sites.

The exposed surface of the cleared floodpool was littered with lithic waste materials derived from common rock types. My first backhoe trench showed such artifact scatters to be confined to only the upper few centimeters of the upper alluvial terraces. As subsurface investigation progressed, however, I eventually encountered the first alluvial terrace above the modern floodplain of the Haw River. It was clear from the initial subsurface exposure that this landform was not a natural levee of the Haw River as had been reported in previous archeological literature. Further, the alluvial sediments composing this terrace were medium to fine grain sands containing deeply buried archeological horizons. Specific zones of dense artifact concentrations also occurred as much as 1.5 meters below the terrace surface. The artifacts encountered were clearly attributable to the Early Archaic Stage of the Southeastern prehistoric sequence.

Rumors persisted among various local archeologists that this was a disturbed site in which artifacts had been displaced by floodwaters. It was abundantly clear from our test excavations, however, that the homogeneity and grain sizes of the sediments containing the archeological remains argued strongly for *in situ* preservation of a thick prehistoric record which promised to span the entire Holocene epoch (a period of approximately 10,000 years). The research potential this site offered was immense.

It is a rare occasion when an archeologist finds a deeply stratified prehistoric site, let alone one which shows a virtually continuous record of human occupation over several thousand years. Sites 31Ch29 and 31Ch8 presented this improbable combination. What made these sites still more unique was the environment in which they were found. The floodplains of the Haw River immediately upstream from the B. Everett Jordan Dam occupy a structural

depression formed by geologic faulting and differential erosion of the underlying rock types. Thus, the Haw River sites are located within a bowl shaped depression into which the steep gradient Haw River empties. An abrupt decrease in stream gradient at this structural boundary, as well as temporary ponding during flood episodes combined to provide rapid burial of archeological evidence by fine grained sands. The same setting also precluded major reworking of the floodplain by extensive meandering.

Major block excavations at 31Ch29 and 31Ch8 continued to verify my impressions that these sites were indeed unique. Discovery of artifact caches and features quickly dispelled claims for site disturbance. Among the findings was an independent verification of the classic work of Dr. Joffre Coe of the University of North Carolina. Dr. Coe's categorizations of North Carolina Piedmont Archaic artifact associations held true and were found in the proper stratigraphic sequence — another indication of the *in situ* relationship of the Haw River sites. This finding belies the major importance of this excavation, however. We were able to build upon Dr. Coe's findings of two decades ago and explore the Haw River sites in greater detail and with more sophisticated methods. Thus, where earlier work helped define archeological sequences, ours centered on context, cultural explanation and refinement of archeological analysis.

In brief, we have prepared a report which will greatly aid Southeastern archeologists in future years. The detailed and critical excavation of these sites has given us a major collection of artifacts representing the cultural development of Piedmont native populations over an 11,000 year period. More important, however, has been the detail in which each artifact was described in the field and prepared for later analysis. Field records from these excavations are a complete and valuable compilation of day to day excavation activities. As critical to future research in this region are the excellent records and drawings kept by each member of the excavation team. These recall with accuracy the often complex stratigraphy and associated archeological features encountered during ongoing excavations. This report summarizes, digests, and explains the data collected from the Haw River sites. The records and collections now become a part of the public record to be curated by the State of North Carolina, Department of Archives and History in Raleigh. Here they will be open for examination by future researchers who will build upon our work as we have built upon that of Dr. Coe.

To summarize my own impressions of this work, I can say with honesty that I came to this project with some feelings of ambivalence. These quickly disappeared as I witnessed the unique nature of the depositional basin in which the sites were found, and the virtually continuous archeological record that was preserved there. These sites represent, in my opinion, one of the most important archeological discoveries in the eastern United States in recent years. I feel privileged to have played a major role in this project which will influence archeologists for years to come.

Curtis E. Larsen

ACKNOWLEDGEMENTS

Large scale archeological projects like the Haw River excavations require equally large commitments of labor and persistence, with tasks ranging from the intellectually stimulating to mindless drudgery. Many people have been involved in the multiple aspects of this project, most temporarily and a chosen (?) few on a more permanent basis. This report is partial testimony to the amount of effort committed to the project by numerous crew members, laboratory personnel, administrators, artists, editors *ad finitum*.

Field investigations at sites 31Ch8, 31Ch29 and 31Ch28 began in May 1979 with a detailed mapping and surface collection program, performed by John Cable, Stephen Claggett and Lisa Novick. Dr. James Mueller served as Principal Investigator for the Phase I work. Geoarcheological fieldwork and analysis, which proved vital to recognition of the significance of the sites, were conducted by Dr. Curtis Larsen.

Submittal of the Phase I findings and mitigation plans was followed by negotiations with the Wilmington District, U.S. Army Corps of Engineers. Those meetings resulted in acceptance of a research design and budget for intensive archeological data recovery at sites 31Ch8 and 31Ch29. Fieldwork began in mid-August and continued, with only minor disruptions due to floods and bridge "demolition" activities, through early December of 1979.

Archeological field crew members, under the supervision of Steve Claggett and John Cable, for the Phase II data recovery operations included the following individuals:

Andy Cahan	Russell McNair
Karen Chittenden	Dave McClelland
Chevis "Wally" Clark	Mike Minnihan
Chris Espenshade	Judy Newkirk
Robbie Ethridge	Bill Phillips
Rich Faflak	Brett Riggs
Dave Foulke	Dale Schopp
Jeff Gundy	Charlotte Smith
Russ Henry	Denise Tillar
Steve Keane	Kevin Vettes

Their hard work, interest and continued good spirits during Piedmont summer heat and winter cold are sincerely appreciated. Immediate laboratory inventorying and preliminary analyses of the recovered artifacts was done by Lynn Linthicum.

On-site recording of geomorphological data and excavation guidance were provided by Curt Larsen and Joe Schuldenrein. Steve Claggett acted as project Field Director and liaison between the diggers, the local community and the Corps of Engineers. Our backhoe operators from Pittsboro Ice and Fuel Company put the many trenches down where and when we needed them.

Laboratory processing of the thousands of flakes, tools, sherds, forms, maps, etc., was supervised by Sara Stech. Others who labored in the Jackson lab from fall of 1979 to early 1981 included:

Chuck Cantley	Lee Novick
Tom Drayton	Jim O'Hara
Chris Espenshade	Brett Riggs
Russ Henry	Ronnie Rogers
Judy Newkirk	

Data entry and processing at the University of Michigan Computing Center in Ann Arbor were conducted at various times by John Cable, Chuck Cantley and Donna Roper. Laboratory and computer applications for the ceramic analyses were performed at the Pennsylvania State University by Alan Snavely and Paul Raber, who also endured a trip to the banks of the Haw River.

The protracted tasks of report uniting, revisions, typing and graphics preparation required the services of many people. Authors of the several report chapters or sections are listed on the table of contents. Contributions of others "behind the scenes" deserve mention as a paltry measure of appreciation for their services. The onerous tasks of production coordination and technical editing were undertaken by Nancy Claggett and Kris Kirsch. Artifact photographs by Dan Hayes are obviously of the highest quality. Design and execution of the many excellent maps, diagrams, figures and photographs may be credited to Steve Treichler, graphics coordinator, ably assisted by Julie Brooks.

Word processing of all these words and numbers was orchestrated by Rose Brown and Pat Damjanac; the keys were pounded by Regina Bynum, Karen Webster, Monica Collett, Tracie Drake, Cynthia Hicks and Debbie Gallant.

Dr. Mueller's tenure as principal investigator for the Haw River project ended in May, 1980, when he left Commonwealth for the Midwest Archeological Center, National Park Service. Dr. Curtis Larsen, now with the United States Geological Survey, consented to fill the vacated position of PI, continuing his participation with the Haw River project on a higher plane than before.

Special thanks are due for our colleagues who agreed to act as peer reviewers for this report; their inputs during fieldwork and analysis phases are likewise appreciated. Those individuals sharing our interests include Drs. Jefferson Chapman (University of Tennessee),

Albert C. Goodyear (University of South Carolina) and J. Ned Woodall (Wake Forest University). Drs. William Farrand and Jack Donahue of the Universities of Michigan and Pittsburgh, respectively, visited the sites and aided with interpretation of the geoarcheological data. Dr. Richard Taketa and Dr. Robert Whallon of the University of Michigan provided guidance with ideas and hard fact applications of statistics and computer mapping operations in Ann Arbor.

A very real debt also is owed to Dr. Joffre Coe (Research Laboratories of Anthropology, University of North Carolina – Chapel Hill). Dr. Coe allowed us to examine collections from the Haw River, Hardaway, Doerschuk, Town Creek and many other sites. He visited the excavations of 31Ch8 and 31Ch29 on several occasions and graciously shared many of his own thoughts and ideas on North Carolina archeology.

Special thanks are due the staff members of the Environmental Branch, Wilmington District, U.S. Army Corps of Engineers. Staff archeologists Michael Corkran, Richard Kimmel and Richard Lewis were helpful at every turn. Richard Jackson of the Wilmington District served as the Contracting Officer's Representative, providing overall administration of the contract in an expeditious and interested fashion.

And finally, although they are connected with no agency or institution, we must acknowledge a special debt to James and Royce Reeves of Pittsboro, North Carolina. They and their families shared the hospitality of their homes and warmth of their friendship with all our crew members. Jimmy and Royce are avocational archeologists, entrepreneurs and all-around good ole boys with whom we formed a *mutually beneficial relationship*, and we thank them.

S.R.C.
March 1982

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CHAPTER 1

INTRODUCTION AND OBJECTIVES

PROJECT BACKGROUND

Archeological sites 31Ch8, 31Ch28 and 31Ch29 have been known to professional archeologists since at least the early 1960s and to amateur relic collectors for several years previous (Smith 1965a; McCormick 1969; James and Royce Reeves, personal communications 1979). Initial survey efforts by professional archeologists located the sites in cultivated fields, situated on rises on the eastern floodplain of the Haw River. Archeological components present at the three sites were identified from both surface collections and excavations; those are described in some detail in Chapter 3 of this report.

Investigations by the University of North Carolina Research Laboratories of Anthropology during the 1960s and early 1970s had demonstrated the potential significance of the Haw River sites, in terms of their well-preserved contents of prehistoric Woodland and Archaic stage remains (Smith 1965b; McCormick 1970; Wilson 1976). Exposure of new surface deposits re-emphasized the need to continue investigations at the sites, in order to deal with an obvious increase in the sites' complexity. Nowhere else in the reservoir impact zone were initial site evaluations so drastically modified as a result of systematic vegetation removal.

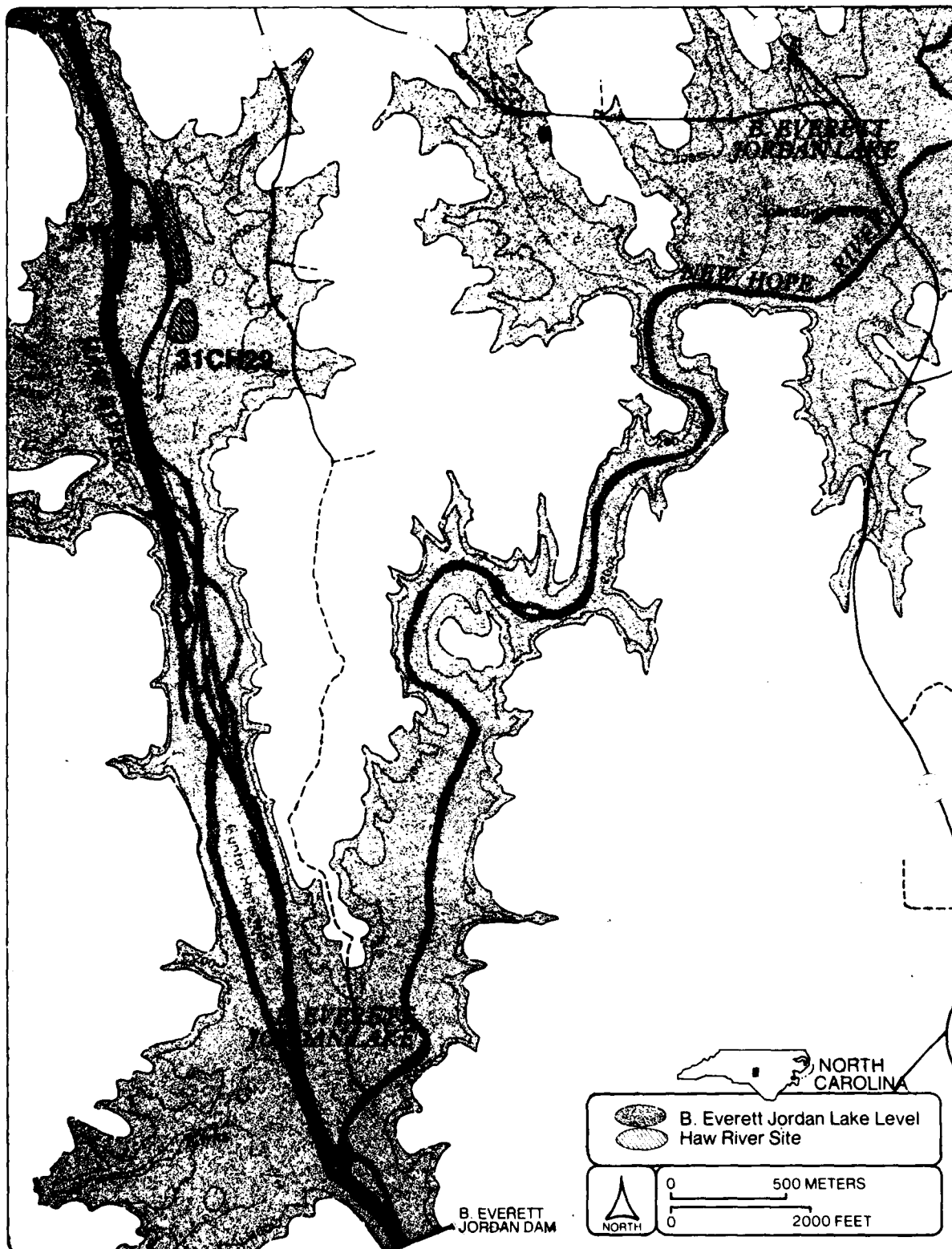
Commonwealth Associates Inc., became involved in archeological investigations of the Haw River site group in early 1979. Mechanized vegetation clearing operations within the reservoir flood pool limits had exposed vast areas of previously unsurveyed land. During a routine impact zone reconnaissance, Wilmington Corps of Engineers (COE) staff archeologists Michael Corkran and Richard Kimmel discovered the 31Ch8-28-29 site boundaries to be considerably larger than originally recorded. Several new areas of surface artifact distributions were noted, especially along the elevated terrace paralleling former State Road 1940 east of the main site group locus (Figure 1.1).

Negotiations between Commonwealth and the Wilmington COE during January 1979 resulted in the development of a preliminary work plan for design of an adequate data recovery project for the known and newly-discovered site elements of the Haw River group. Central concerns were the monitoring and evaluation of intra- and intersite artifact patternings, in conjunction with geomorphologic studies to clarify the natural site formation processes at work along the Haw River.

Phase I of the investigation was conducted during May 1979, by Commonwealth staff archeologists Stephen R. Claggett and John S. Cable; James W. Mueller served as Principal Investigator. Specific techniques implemented during Phase I included controlled surface collections of artifacts, computer-assisted mapping of the several collected artifact categories, and hand and machine excavations to determine the extent and nature of subsurface archeological remains. Mechanical excavations were performed also to investigate the geomorphologic processes that had influenced site formation processes at the Haw River site group.

Phase I investigations were reported to the Wilmington COE in July 1979, along with a data recovery plan based on those findings. Detailed analyses may be found in that report, performed under Contract DACW54-79-C-0020, but can be summarized as follows (Mueller, Claggett, Cable and Larsen 1979:26-31):

1. Prehistoric artifacts representative of the Paleo-Indian through late prehistoric stages were found distributed across *all portions of the floodplain*, thus considerably enlarging the originally perceived site boundaries. Surface limits of 31Ch8 and 31Ch29 were extended some distance north and seemed to merge into a near-continuous scatter, broken only by post-occupational erosion forces.
2. Not unexpectedly, artifacts and raw materials were arrayed differentially within the collected areas; concentrations generally conformed to higher elevations, while lowest densities occurred in the low-lying areas.
3. Based on relative densities of surface artifacts, a case could be made for assigning a new site number to the concentrations of lithic debris along the eastern terrace.
4. Differential distributions of raw materials and several classes of lithic reduction debris suggested that "workshop" areas are present. Initial reduction appears to have taken place more commonly on the terrace elevations farthest from the river.
5. Few grid cells produced diagnostic artifact forms (hafted bifaces or ceramics). This condition is attributable to several factors, including variations in surface visibility and a long history of amateur and professional surface collecting. The majority of recognizable forms are assignable to the Middle Archaic substage (\pm 8000-5000 years Before Present [B.P.]), according to current typological-temporal frameworks (Coe 1964; Chapter 3, this report). Woodland stage ceramics were typically confined to the test excavations on 31Ch8 and 31Ch29, although few triangular arrow points were collected from any grid units.
6. The deep testing program yielded important information on the nature of archeological remains vis-a-vis geological formations present in that floodplain environment. Pleistocene age terraces on the east and north ranges of the grid contain archeological remains only on or just under their surface. No buried remains are present deeper than 10 to 15 cm in those areas.



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA

COMMONWEALTH ASSOCIATES, INC.

FIGURE 1.1
 PROJECT LOCATION

Elevations nearer the river, particularly those previously identified as "levees" (Smith 1965b; McCormick 1970; Wilson 1976), are actually Holocene age terrace remnants. Besides containing shallow deposits of Woodland stage materials in the known areas of 31Ch8 and 31Ch29, those formations were demonstrated to contain deeply-buried archeological strata to a depth of at least 2m below surface. At least one Early Archaic (Kirk) occupation zone was traced between several of the trenches, exhibiting remarkable continuity at an average elevation of 54 to 55m above sea level over a linear horizontal distance of at least 400m. All trenches (n=12) along the recent terrace system produced cultural materials, with evident concentrations of Middle and Early Archaic remains.

7. Natural stratigraphy observed in the backhoe trenches varied from heavy clays in the low-lying backswamps to alternating, horizontal bands of alluvial sands and clays in the recent terraces. The latter profiles were initially felt to be the products of overbank depositional cycles; this report details the most recent interpretations of that stratigraphic situation. The potential importance of those alternating soil layers for archeological interpretations remains basically unchanged, however.

Based on the detailed findings of the Phase I investigations, a plan was formulated for archeological mitigations of adverse impacts to sites 31Ch8 and 31Ch29. Whereas the initial objective of determining and interpreting the horizontal spatial limits of the site group had been accomplished, we were faced with a new problem set concerning adequate treatment and evaluation of a series of deeply stratified occupations which spanned at least 10,000 years of prehistory. The general research design under which this was accomplished is outlined in the following paragraphs.

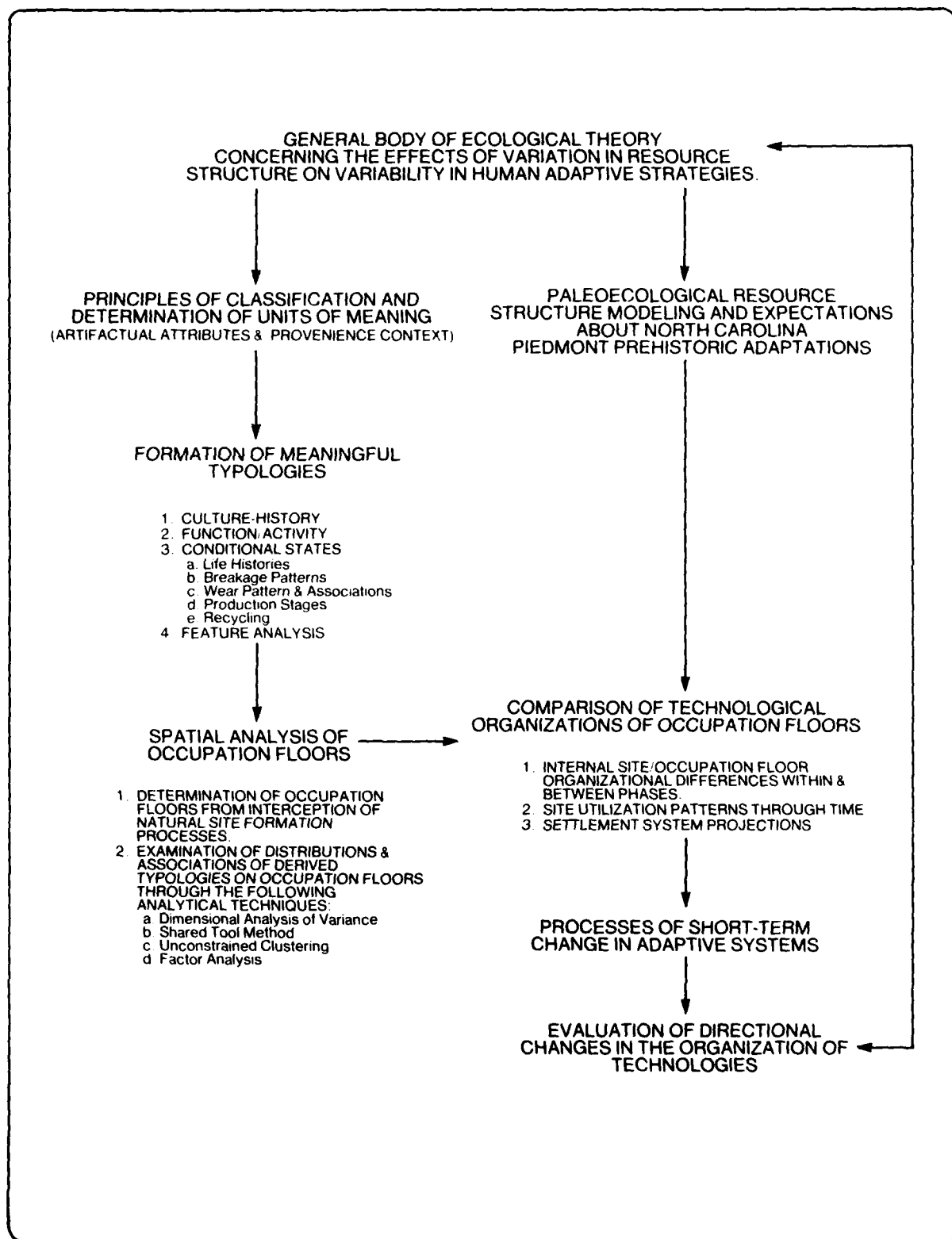
GENERAL RESEARCH OBJECTIVES

The Haw River archeological project was designed to address a broad range of research objectives. These can be grouped into several subsets: 1) cultural-historical description and integration; 2) interpretations of adaptive and technological strategies; and 3) spatial analysis of occupation floors. A procedural diagram of the manner in which this research was conducted is shown in Figure 1.2.

Two major issues within the realm of cultural-historical integration concern the temporal relationship of the New Hope and Yadkin ceramic series and the temporal and functional placement of the bifurcate tradition in North Carolina. It will be shown that these questions are ultimately explained by means of processual interpretations.

Adaptive change in hunter-gatherer systems is approached from an environmental perspective. In the case of early to middle Holocene hunter-gatherer adaptive systems, mobility strategies are viewed in terms of a predictive model of post-Pleistocene environmental change.

Spatial analysis of the occupation floors was designed to provide exploratory interpretations of the internal spatial organization of prehistoric settlements. Lithic and ceramic assemblages from several occupation floors at sites 31Ch29 and 31Ch8 have been examined. We have sought to determine how the organization of those items in physical space reflects both the cultural and natural forces which affect the formation of archeological sites.



DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 1.2
CONCEPTUAL MODEL OF
GENERAL RESEARCH DESIGN

CHAPTER 2 RESEARCHABLE PROBLEM AREAS

DIRECTIONALITY IN TECHNOLOGICAL ADAPTATIONS

Despite inherent analytical and logistical problems, deeply-stratified archeological sites provide unique opportunities to study long, continuous sequences of cultural remains (Brown 1975). In concordance with the developing goals of American archeology, deep site excavations traditionally have been conducted for purposes of revealing and confirming sequences of artifact assemblages and the "cultures" they represent (Miller 1949; Logan 1952; Fowler 1959; Husscher 1964; Coe 1964; Broyles 1971). More recent efforts also have attempted to define environmental correlates of cultural sequences (Griffin 1967; McMillan 1971; Houart 1971; Chapman 1975, 1977, 1978), but for the most part, culture history and cultural reconstruction (Dunnell 1978a) have remained the primary goals of deep-site investigations.

Chapter 4 of this report discusses specific field and laboratory techniques used to extract and treat the Haw River data. From the inception of our data recovery efforts, those techniques were designed (and modified) to exploit the opportunities presented by an areally-extensive and deeply-stratified site cluster (Chapters 1 and 3). Efforts were made to systematically record all horizontal and vertical arrangements of artifact assemblages. Exacting controls on item proveniences allow us to make detailed analyses of the spatial arrangements of materials and define patterns that are both synchronic (horizontal) and diachronic (vertical) in nature.

Given this opportunity, one of our earliest defined research goals was to examine variability in artifact assemblages through the 10,000-12,000 years of represented pre-history. We have attempted to surpass more traditional reconstructionist goals of typology and cultural history and, instead, isolate and monitor through time those technological variables that reflect adaptational changes in cultural systems.

First steps in that direction, of course, involved the use of traditionally-defined artifact typologies to assign relative dates to the various occupational zones. The Haw River excavations generally have tended to reconfirm the applicability of those cultural-temporal frameworks (Coe 1964; Chapman 1975; Broyles 1971; Griffin 1978; DeJarnette et al. 1962) to the Jordan Reservoir region. In other words, we tend to concur with basic cultural reconstructions for Paleo-Indian, Archaic and Woodland stage occupations of the larger Piedmont region, many of which have been gained through deep-site investigations (Chapter 3). We will however, reexamine the functional or stylistic nature of the typological constructs on which those reconstructions are based.

Archeological investigations of interassemblage variability have taken several (dependent) courses, beginning with the "classical" typological studies of Old World Paleolithic researchers (Bordes 1961), which also have enjoyed limited applications in the New World (White et al. 1963; Winters 1969; Faulkner and McCollough 1973). More recent evaluative techniques have involved the rigorous application of powerful statistical techniques for the definition and comparison of tools and assemblages (Binford and Binford 1966, 1969; Wilmsen 1970; Stiles 1977). On a more theoretical level, Americanist typological studies have been concerned as well with the validity of formulated archeological units (Spaulding 1953; Ford 1954), which ultimately may be dependent on the goals of the inquiry (Dunnell 1978b: 196-197).

Most recent studies of typology and assemblage variability have concentrated on theoretical underpinnings or underlying anthropological goals of explaining human behavior (Dunnell 1978a). Those developing lines of inquiry are bolstered, however, by methodological advances in lithic analysis (Hayden, editor 1979; Keeley 1980; Cahen et al. 1979) which have facilitated the challenging of established typological and interpretive concepts. Archeologists now are questioning the basic assumptions of more traditional studies concerned with culture history or cultural reconstruction rather than accepting conclusions based in empirically-generated tool and assemblage comparisons. The very basic question of whether function actually or necessarily follows form is being critically reviewed (Jelinek 1976; Dunnell 1978b).

Whereas traditional comparisons were based on the implicit acceptance of evolutionary stylistic trends, archeologists increasingly are concerned with the adaptational, true evolutionary role of lithic tools within entire technological and cultural systems. Traits or modes of tools are important only insofar as they are selectively advantageous; *style*, on the other hand, is a less easily definable concept having to do with stochastic processes that "do not have detectable selective values" (Dunnell 1978b:199).

What we therefore propose to do with the available lithic assemblage data from the Haw River sites involves the isolation and monitoring through time of tool attributes, modes or assemblages that were functional, rather than merely stylistic, elements of the several occupations preserved archeologically at the Haw River sites. As Dunnell (1978b:198) has said:

In an evolutionary framework, we would incline to explain the fixation of a particular form as a consequence of the increased Darwinian fitness that its presence confers on its transmitters.

In order to accomplish this goal, we will treat the Haw River sites as an open-air laboratory, where we can examine changes in the content and character of lithic artifact assemblages over a long temporal span which significantly includes a major hypothesized shift in interdependent subsistence, mobility and technological systems (Chapter 11).

Changes in technological organization will be interpreted as adaptational responses to environmental and cultural variables, rather than processes of random cultural drift. Since we are examining a fixed geographical locus, the represented assemblages might be considered to have evolved independent of environmental factors that might influence conditions if we were comparing several discrete site locations. However, as discussed elsewhere in this report, the represented time element of the Haw River data means that various factors of climate and geomorphology have directly influenced the sites' occupations, not to mention the availability or suitability of subsistence resources.

We will proceed by isolating several occupation floors and comparing them as separate entities, *but* with the advantage of knowing that continuities in adaptational strategies do exist and should be isolable from within the mass of data, since the occupations are basically superimposed. What we seek to do, therefore, is explain why and how site usage changed in response to various environmental conditions, as reflected in the lithic technological system that supported the inhabitants.

To that end, several general research questions or expectations can be formulated which will elucidate the Haw River interactive role of lithic assemblages and environments.

1. Since our preferred method of studying prehistoric change is in terms of mobility patterns (Binford n.d., 1980) we would expect the overall composition of assemblages to vary directly with the degree of residential or logistical mobility characteristic of any particular occupation.
2. Systems that are more logistically organized should produce more tools (or sub-elements) indicative of planned maintenance strategies, such as larger initial size, choice of better quality raw materials, and primary edge angles or haft elements that are amenable to contingency-effected repair or rejuvenation.
3. Residentially organized systems should produce greater numbers of expedient tools, since tool obsolescence can be more easily planned under conditions of predictable raw material availability.
4. Expedient tools or the direct byproducts of tool manufacturing (debitage) are more reliable indicators of activities performed during any given occupation. Maintained (curated) forms are present in the archeological record in inverse proportions to their actual use, since the amount of energy expended in their manufacture and maintenance conditions their retention rather than discard.
5. Relative densities of artifacts or debitage between occupations may not necessarily reflect changes in site use intensity; constraints on physical space available for habitation and/or situations or artifact scavenging and reuse may tend to pattern artifacts (see Chapter 12). Site usage may be conditioned by prior site occupations, which provide opportunities for raw material scavenging and may otherwise alter the site environs.

Analyses performed to address these general questions will proceed on several levels of progressively increasing complexity. Rather than deal exclusively with assemblages as comparative units, we shall first isolate single *elements* or *modes* of tools such as edge angles, blade/tang thickness, etc., and determine if long-term patterns exist in their rates of retention or rejection. This assumes, of course, that such basic measures are subject to selective pressures as they successfully or unsuccessfully meet the environmentally influenced needs of their users. By concentrating first on subelements of larger combinations called tools, we avoid (we hope) the pit-falls of unconsciously assigning functional labels to lithic specimens.

The second level of analysis, however, will consider synchronic variations in whole objects. Certain cases, such as expediently produced flake tools, will exhibit only a very limited set of variables in their functionally-dictated construction. The preceding caveat on assigning functions will be heeded as nearly as possible.

Assemblage comparisons are the third level of analysis, comparable in certain respects to the efforts of other researchers, yet evolved from initial comparisons of less complex reflections of adaptational strategies. This we consider the grossest level of analysis, but treatment of the Haw River data in that form facilitates correlation of our methods and results with earlier studies dealing almost exclusively with assemblage-level information.

DEVELOPMENT OF A PIEDMONT HUNTER-GATHERER SETTLEMENT MODEL

A central focus of the Haw River investigations is the effect of changing environmental conditions during the early to mid-Holocene on hunter-gatherer adaptive organization in the North Carolina Piedmont. Hunter-gatherer adaptive organization is approached from the perspective of subsistence-settlement systems. Binford (1980, n.d.) has recently argued that hunter-gatherers organize their subsistence-settlement systems through the use of mobility strategies responsive to critical resource distributions. He distinguishes two basic strategies for the positioning of the respective members — producers and consumers — of a social unit: "mapping on" and logistical mobility. "Mapping on" solves the problems of food procurement in environments where critical resources are distributed congruently (homogeneously) and exhibit low nucleation. This is accomplished through frequent moves by the entire social unit from one residential locus to another (high residential mobility). Logistical mobility, by contrast, solves the food procurement problem in environments where resources are spatially and/or temporally incongruent (independent). This strategy entails more permanent residences and greater dependence on specialized task groups of producers who provide for the subsistence of the social unit through frequent planned procurement trips away from the residence. Binford has demonstrated that different resource structures tend to be correlated with variable environmental conditions. Cool environments are associated with incongruent resource distributions while warmer environments generally exhibit greater congruence of critical resources. Comparison of these expectations with the paleoclimatic record of the Early to Middle Holocene provides a framework from which to observe and study the nature of changes in hunter-gatherer adaptive organization in the North Carolina Piedmont.

Paleoclimatic reconstructions of the Holocene environment of North America indicate that deglaciation began approximately 14,000 years B.P. after a long period of glacial climates. A comparatively rapid warming trend continued from this date until the end of the climatic optimum or Altithermal, chronologically placed between 8,000 and 4,000 years B.P. This dramatic thermal gradient is recorded as a succession of forest types in the South Appalachian Southeast: 1) Pine-spruce parkland or forest (Late Glacial — ca. 13,000 years B.P.); 2) "Northern hardwoods complex" (ca. 13,000-9,500 years B.P.); 3) Oak-hickory forest (ca. 9,500-7,000 years B.P.); and 4) Oak-pine forest (ca. 7,000 years B.P.-present). It is suggested that this dynamic and rapid shift from a cool, boreal setting to a warmer, temperate setting might cause the adaptive organizations of early to mid-Holocene hunter-gatherers to exhibit a hypothetical directional trend from systems emphasizing logistical mobility to systems dominated by "mapping on" strategies. Since logistical strategies result in fewer residential moves, we should expect a decrease in the degree of residential permanence from the Early to Middle Holocene. This expectation opposes the prevalent viewpoint that sedentariness was a gradually increasing process through the course of the Holocene.

Data from the Haw River site group excavation are used to study the character of the changes involved in this directional trend. This is accomplished through the spatial analysis of occupation floors and a lithic analysis program designed to reflect variables relevant to mobility strategies (i.e., life history information, breakage patterns, and reduction stage patterns). Ultimately, the spatial analysis of lithic artifact associations is used to identify types of occupations which can be compared to Binford's expectations for site variability in systems emphasizing "mapping on" strategies (i.e., residential base camps and locations) versus systems emphasizing logistical mobility (i.e., residential base camps, locations, field camps, stations and caches). The results of this research provide a starting point for identifying processes of change which moved hunter-gatherers in the North Carolina Piedmont away from a logistically based adaption toward a "mapping on" mobility strategy or foraging adaptation during the early to mid-Holocene.

THE NATURE OF ARCHAIC TO WOODLAND TRANSITIONS AT THE HAW RIVER SITES

One of the original research goals for the Haw River data recovery program was to address a perennial question of how archeological remains evidence the transition from Late Archaic to Early Woodland. The technological and cultural gap between those two substages is poorly understood throughout North America and, for the southern Piedmont, constitutes a major area of controversy within otherwise well-defined chronological frameworks, such as that of Coe (1964).

Chapter 3 of this report summarizes current knowledge on the respective temporal — cultural constructs of Late Archaic and Early Woodland in the Southeast. Drawing on sources like Caldwell (1958), Griffin (1967, 1978) and Dragoo (1976), a transition can be generally defined between the two. During a temporal span of 2000 to 3000 years, eastern woodland cultures changed from semi-sedentary gathering-hunting lifeways exploiting

riparian and upland resources to seemingly more complex societies using ceramic containers, producing some cultivated foods and participating in far-flung trade networks and burial ceremonialism. Most analysts concur, however, that the distinguishing Woodland characteristics of ceramics, cultigens, trade and mound-building were very gradual adoptions, firmly rooted in the earlier Archaic stage and accepted by "Woodland" groups at highly variable rates (Griffin 1978). As Dragoo (1976:16) has stated

the once seemingly clear division between the two periods does not exist since continuity can be demonstrated in all the previously discussed Archaic traditions. Traits once believed to be indicative of the Early Woodland period can now be shown to have long histories in the Archaic. The only *obvious* criterion for distinguishing terminal Archaic complexes from Early Woodland is the addition of ceramics to the latter [emphasis ours].

The nature of a transition within the Piedmont archeological record is poorly defined in terms of social, environmental and subsistence reorganizations as well as on the most basic level of material culture changes. As previously discussed, the generally sound chronological frameworks of Coe (1952, 1964), derived from excavations of culturally and naturally stratified sites, could discern no more than a "cultural discontinuity" between successive Late Archaic Savannah River and Early Woodland Badin or Vincent occupations of North Carolina Piedmont sites. Elsewhere in eastern North America, including the Coastal Plain and Mountain regions of North Carolina, the problem does not appear to be so outstanding (Loftfield 1976; Phelps 1980; Purrington 1980; Keel 1976). In those regions, at least on the level of material culture (projectile point and ceramic) sequences, valid continuities have been demonstrated. Neighboring regions also witness some forms of gradual change (Stoltman 1974; Chapman 1973; Schroedl 1978; Faulkner and Graham 1966).

The decision to pose a research question involving the Archaic-Woodland transition at the Haw River sites was based on several factors. On a general level of the eastern woodlands, it is common knowledge that sites of the periods in question are frequently located in riverine environs, probably due to shared subsistence orientations (Turnbaugh 1975; Cook 1976). Similar expectations concerning site distributions in the Piedmont have been verified through surveys and excavations (Coe 1964; Woodall and Claggett 1974; Taylor and Smith 1978; Goodyear, House and Ackerly 1979).

A second factor that conditioned our choice of research questions was that numerous Late Archaic and several Early Woodland (Badin) site localities had been identified during previous surveys of Jordan Reservoir (Smith 1965b; McCormick 1969). Plots of available site content data from those reports indicate that Savannah River materials are among the most abundant (if not easily recognizable) of all prehistoric occupations in the area, constituting some 40 percent of all identified site components (McCormick 1969:37). Fewer than 100 sites can be definitely assigned to a Savannah River substage, however, based on published site descriptions, and the figure of 21 percent later offered by McCormick (1970: 25) may be more accurate. Identifiable sites of Late Archaic/Early Woodland substages

are dispersed over the entire basin of the New Hope River, with apparent concentrations on the major floodplains and near stream confluences. Our further impression is that Badin materials frequently co-occur at the same loci, although this has not been verified statistically.

Survey data from the Haw River portion of the reservoir are rather attenuated (see Chapter 3); however, Savannah River and Badin substage artifacts were recovered at sites 31Ch8, Ch34 and Ch159 (Smith 1965b; McCormick 1969). Verification of those occupations was provided also during excavations at sites 31Ch28 and Ch29. The latter site provided the only potential for stratigraphic continuity of Archaic and Woodland components and received a limited amount of excavation to further explore that situation (Wilson 1976). The presence, however elusive, of both Badin and Savannah River materials at 31Ch29 was the third factor influencing our choice of potential research goals (Mueller et al. 1979).

Chapters 9 and 10 of this report summarize our findings and interpretations of Archaic to Woodland transitions in terms of the data recovered at sites 31Ch29 and Ch8. Contrary to previous investigations of that "problem", we view the change from a slightly larger temporal, and we hope cultural, perspective, following the lead of Stoltman (1978). In the context of arguing for a revised chronological scheme for eastern North American prehistory, Stoltman recognizes the gradualness of change and adoption of new "traits" or technologies; the Late Archaic/Early Woodland transition period is accordingly subsumed within a "Transitional II Period" (1978:715-717), which is inclusive of and sensitive to regionalized acceptance patterns of ceramics and cultigens as well as participation in systems of extra-regional trade or mortuary practices.

It will also be seen that artifactual evidence for such a transition is by and large missing from the recovered stratigraphic data at the Haw River sites. Reasons are offered for its absence, both in light of the overall research strategy and implemented field methods and the absence of similar remains from analogous contexts in the Southeast.

BIFURCATE TRADITION OCCUPATIONS AT 31CH29

It was initially predicted that fairly complete artifact sequences from the Early Archaic substage would be recovered at 31Ch29, based on information gained from deep testing operations performed by Commonwealth archeologists in 1979 and crews from the University of North Carolina several years earlier (Mueller et al. 1979; Wilson 1976). Preliminary excavations had revealed typical Kirk artifact forms (Coe 1964) as the significant portion of that Early Archaic stratigraphic element; their demonstrated presence eventually formed much of the justification for additional mitigative excavations at the site (Chapter 1). The potential for other Early Archaic occupations was recognized as well, and recovery of other point varieties such as Palmer or, possibly, Big Sandy also was anticipated from earlier investigations (Coe 1964; Smith 1965b; Mueller et al. 1979).

A major unexpected result of the 1979 excavations was discovery of several hafted bifaces typical of what have been called "bifurcate tradition" occupations (Chapman 1975). Excavators found complete and broken specimens identifiable as MacCorkle, St. Albans, LeCroy and Kanawha varieties, based on published type descriptions (Kneberg 1956; Broyles 1971; Chapman 1975). Stratigraphic placement of individual specimens is somewhat variable, due to several site formation and disturbance factors explored in Chapters 6 and 9 of this report. Nevertheless, the various bifurcate points were generally recovered from arbitrary levels 14 through 21, which places them in correct stratigraphic and, by correlation, temporal sequence between earlier (Kirk) and later (Stanly and Morrow Mountain) occupation floors (Chapters 9, 12 and Appendix 2).

Jefferson Chapman has constructed an explanatory model concerning the geographic distribution and temporal-cultural placement of bifurcate base points, primarily inspired by the discovery and analysis of several bifurcate tradition sites in the Little Tennessee River Valley (Chapman 1975, 1976, 1977, 1978, 1979). As early as 1964, J. E. Fitting had suggested that bifurcate points formed at least two recognizable continuums in eastern North American prehistory; then-current opinion would date at least one to an Early Archaic period, based on associational and distributional data similar to other early materials (Fitting 1964).

Chapman's model incorporates more recent distributional and radiometric data to demonstrate that point base bifurcation, in combination with other morphological attributes, can serve as a legitimate Early Archaic horizon marker, in the sense that Dalton, Big Sandy and Kirk forms constitute comparable horizon markers, as defined by Tuck (1974). Horizon styles are particular artifact forms or traits that exhibit wide geographic distribution — in this case, over most of eastern North America. Markers embody low degrees of within-class morphological, stylistic and possibly functional variability and also occupy restricted temporal spans. All of those attributes logically contribute to their utility as temporal-cultural identifiers (Willey and Phillips 1958:31-33). Relative homogeneity of Early Archaic assemblages, other than projectile point forms (Dalton, Big Sandy, Kirk, Bifurcates), both demonstrates a fair continuum of adaptive strategies (Chapter 3) and reinforces the utility of diagnostic artifacts or "horizon markers" for definition of cultural-chronological patterns (Coe 1964; Chapman 1975).

Chapman has traced the history of bifurcate points as a recognized variety in eastern North American prehistory (Lewis and Kneberg 1952, 1953, 1955; Fitting 1964, Broyles 1971 and others), noting that until fairly recently they could not be exclusively assigned to Early Archaic contexts. Stratified remains and series of radiocarbon dates from the St. Albans (West Virginia), Rose Island (Tennessee) and other sites now demonstrate that bifurcate points occupy a very narrow temporal span of ca. 8850 to 8150 years B.P. (Chapter 3 and Figure 3.1; Chapman 1975, 1976; Broyles 1971).

Available information on the geographic distribution of bifurcates suggested to Chapman that bifurcation as a stylistic or functional attribute is a pan-Eastern phenomenon, with apparent concentrations only in a limited number of alluvial valley settings like St. Albans, Rose Island and the LeCroy sites. Limits of the distribution also roughly coincide with the boundaries of the eastern deciduous forest (Chapman 1975:256 and Figure 16). Ecological conditions during the seventh millenium B.C. in adjacent vegetation zones such as Coastal Plain pine forests, Canadian Province boreal forests or western prairies apparently precluded expansion of the bifurcate tradition into those regions (Chapman 1975:267).

Other archeologists have discerned the same pattern for the Northeast (Turnbaugh 1973; Wright 1978; Ritchie and Funk 1971); finds of bifurcate points as far north as southern Ontario serve to refute earlier contentions that the region was uninhabited during Early Archaic times (Fitting 1968).

While recent data have extended the range of bifurcate occupations, several factors other than stylistic and general environmental correlates remained unexplained. It is felt that the data from 31Ch29 can contribute significantly to solution of some of the outstanding problems. Simple confirmation of Chapman's distribution model is the most obvious aspect of the new information. Close monitoring of the stratigraphic and environmental conditions under which the 31Ch29 deposits were formed allow definition of the formation processes which preserved the bifurcate and other site components, a situation that Chapman also has addressed at his Tennessee sites (Foley and Chapman 1977). Chapters 5, 6 and 13 deal with environmental variables that conditioned the Haw River site area for utilization by bifurcate tradition people as well.

The bifurcate phase data from 31Ch29 are treated in Chapter 13 of this report in terms of several points central to Chapman's 1975 settlement-subsistence model. Our data verify the existence of an intensive bifurcate occupation in an alluvial valley setting, quite distant from any supposed Appalachian heartland. The ecological diversity of a fall zone setting will be explored as an additional attractant for this apparent extension and concentration at the juncture of the Piedmont and Coastal Plain.

Chapman (1975:268) has also suggested several other implications as the result of his analyses which transcend simple distributional studies. They can be summarized as follows:

1. Basal bifurcation was considered to be functionally advantageous because it increased stability of the haft element, in conjunction with inferred cutting and scraping activities;
2. Cutting functions were likewise inferred due to apparent resharpening and attritional reduction in overall blade dimensions;
3. Other archeologists have suggested usage of bifurcates as harpoon points (Fowler 1961), although Chapman has rejected the idea on geographic and ecological grounds;

4. A pattern of overall point size reduction during the bifurcate tradition period (7000-6000 B.C.) somehow was felt to reflect changes in hafting techniques, or by extension, a related shift in hunting patterns.

5. Certain gradual changes in hafting techniques were speculated to have been coincidental with adoption of the atlatl, either during the Clovis (lanceolate) to Kirk (corner-notched) transition (Gardner 1974:24) or the Kirk to bifurcate transition (Chapman 1977:124). No methods for verifying that hypothesis have been forwarded, however (cf. Thomas 1978).

Several related research questions can be outlined at this point, in addition to those inherent on Chapman's model, which will be examined in detail in Chapter 9:

1. Which traditionally defined bifurcate point types (or subtypes) are present at 31Ch29, and how well do they fit the typological parameters established at other sites (Broyles 1971; Chapman 1975, 1977, 1979)?

2. What other lithic tool forms are included in bifurcate phase occupation floors at 31Ch29, and do they exhibit continuities within earlier and later occupations?

3. Which specific attributes of bifurcate points are similar or dissimilar to earlier (Kirk) and later (Stanly, Morrow Mountain) forms?

4. As a typological or functional class, why do bifurcate points change so dramatically within a relatively short time span? How might those changes mirror larger environmental or cultural changes?

Explicit interpretive goals of this report include the explanation of prehistoric adaptation in terms of logistical patterns and technological organization (Binford 1976; Kelly 1980). Relative mobility is one element we have selected as a measure of adaptation to certain ecological and social conditions (Chapter 11; Binford n.d.a, n.d.b; Kelly 1980). The bifurcate remains from 31Ch29 are interpreted in view of those larger goals. We have measured several single or combined attribute elements of bifurcate points and associated tools in order to address questions concerning their distribution and role as cultural-chronological indicators. The bifurcate occupations are treated comparatively with earlier (Kirk) and later (Morrow Mountain) assemblages. Statements are also made concerning the role of technological attributes within organized hunter-gatherer logistical systems.

The fact that archeological specimens are the end products of technological life histories is almost universally disregarded in traditional typological analyses. In systemic terms, artifacts do not actually enter archeological context until they are discarded due to breakage, loss or exhaustion (Schiffer 1976:30-31, 46-47). Recognition of that transformation process should tend to negate, or at least modify the importance accorded to traditional typological measures such as maximum length, width, thickness, etc. Quantified combinations of those

attributes measure only the *terminal* artifact condition and hence point of discard (or loss — cf. Fehon and Schultz 1978). Traditional typologies thus have the potential to separate initially similar artifacts (morphologically *or* functionally) into several mutually exclusive "types," because of an inherent recognition of conditional artifact states (Ahler 1971).

Defined types may further exhibit no real temporal or spatial integrity when used to examine broader archeological questions of chronology or settlement systems. It must be clearly understood that defined types are only segments of a continuum which "lump" several conditional states; only then can attribute combinations be seen to reflect evolutionary adaptive systems of behavior.

Morphological and technological attribute analysis of bifurcate points and monitoring of diachronic patterns of technological change permits us to address certain of these problems. Published type descriptions provide classificatory parameters for determining the "type" of most individual specimens. Those, in turn, have demonstrated fair amounts of temporal and stratigraphic integrity (Broyles 1971; Chapman 1975; Coe 1964). What they cannot provide, however, are accurate means for monitoring the gradual, incremental changes in artifacts which should reflect the roles performed by those tools within adaptive systems of culture.

CHAPTER 3 ARCHEOLOGICAL BACKGROUND

PREHISTORIC ARCHEOLOGICAL BACKGROUND

Introduction

The research detailed elsewhere in this report completely lacks meaning without some definition of the terms used and appreciation of the involved time depth. This chapter will discuss the prehistory of the North Carolina Piedmont, where the Haw River sites are located, in order to provide the necessary background for understanding the content, nature and importance of those sites. Attentions are focused on the North Carolina Piedmont as a circumscribed region, as discussed by Coe (1952, 1964), but must also consider extra-regional contexts of the Southeast as a larger environmental and cultural entity. Many continuities existed in this larger area, in terms of artifact styles, social organization and economic patterns (Griffin 1967; Stoltman 1978), and these will be discussed here in a basic cultural/chronological framework as currently understood by archeologists and ethno-historians.

Terms used by archeologists to describe various prehistoric groups and their distinctive archeological remains of lithic tools, ceramics, settlement patterns, etc., have no *inherent* meaning. Instead, they are simply accepted heuristic devices for the differentiation and categorization of archeologically perceived cultural or technological patterns (Krieger 1964; Stoltman 1978).

The processes by which archeological sites are created, preserved and defined, are a major area of methodological and theoretical concern among professional archeologists. Discussion of those processes is outside the scope of this report section, but may be found in the literature (Binford 1965; Schiffer 1972, 1976).

No absolute temporal or spatial boundaries have been demonstrated for the stages or traditions named, for example, Paleo-Indian, Archaic or Woodland. Instead, current research tends to demonstrate that changes in artifact styles, economic orientations or physical types are more the results of gradual, multidimensional responses to cultural or natural environmental fluctuations than of abrupt displacements or migrations of new populations or ideas.

Various descriptive schemes and terms have been devised through the years to segregate individual stages, traditions, phases and foci of eastern North America prehistory (cf. Willey 1966; Coe 1952, 1964; Williams and Stoltman 1965; Willey and Phillips 1958; Sears 1964; Krieger 1964; Stoltman 1978). All possess certain utility in light of the nature and scope of the "cultures" or events they seek to describe, but no one classificatory scheme is necessarily more correct than another. The cultural/chronological terminology used in this report

does, however, follow the example currently accepted by the majority of Southeastern archeologists, if for no other reason than to maintain existing communications (cf. Griffin 1964, 1967; Dragoo 1976; Chapman 1975, 1977; Goodyear, House and Ackerly 1979; Taylor and Smith 1978; Gardner 1974).

Any archeological research in the Piedmont must ultimately acknowledge the seminal work of Joffre Coe, whose publications on North Carolina prehistory (1952, 1964) have provided the chronological underpinnings for most other investigations in southeastern North America (see Chapman 1975, 1977; Holland 1970; Broyles 1971; Haag 1958; DeJarnette et al. 1962; Keel 1976; Dickens 1976; Ferguson 1971). Indeed, much of the data from outside the immediate Piedmont environs which form the basis for this discussion have been generated by Coe's former students (see above citations). Coe's excavations at the Lowder's Ferry, Hardaway, Doerschuk and Gaston sites, as reported in *The Formative Cultures of the Carolina Piedmont* (1964), constituted the first irrefutable evidence of deeply-stratified prehistoric occupations from eastern North America. The identifications and continuities of artifact forms and cultural stages outlined by Coe have yet to be substantially altered and remain elemental sources for interpretations of Southeastern and Eastern prehistory (Griffin 1967; Dragoo 1976).

The record of the Hardaway, Doerschuk and Gaston sites allowed Coe to construct the chronological framework that had only been hinted at prior to that time (Coe 1952; Griffin 1952). Of course, other researchers in the Southeast had recognized the possibility for temporal orderings of cultural stages or traditions (Griffin 1952; DeJarnette 1952; Webb 1974; Webb and DeJarnette 1942; Fairbanks 1952; Caldwell 1952, 1958; Lewis and Lewis 1961). But Coe provided absolute evidence for suspected successions and continuity between several sites, as well as the involved time depth of several thousand years. His sequential ordering of cultures from early Holocene through protohistoric times was based on three categories of data. Arranged in order of increased sophistication, those were: 1) comparative typologies of artifacts from the North Carolina sites with specimens found elsewhere in North America in poorly-defined contexts; 2) stratigraphic sequences of superimposed, yet spatially discrete artifact assemblages, particularly temporally sensitive "projectile points" and ceramic sherds; and, 3) absolute radiometric dates from hearths and other features associated with artifacts and cultural strata. A fourth data set, which is specifically related to category 1 (above) is the tracing, through examination of historic documents, maps, and artifacts, of the prehistoric and protohistoric ancestors of historically recorded aboriginal groups. Coe's preoccupation with discovering the origins of ethnohistoric "tribal" groups of the Piedmont is less pertinent to our research than his other methods, but also has been a major area of inquiry (Coe 1952; Coe and Lewis 1952; Griffin 1945; Binford 1964; Miller 1962; Fairbanks 1952).

Recent studies of Southeastern prehistory necessarily continue to draw on (and even improve) the chronological frameworks established by earlier investigators. As part of the archeological "revolution" of the past two decades, however, theoretical and methodological attentions have shifted significantly toward understanding the behavioral patterns

suggested by archeological remains, in hopes of ultimately deriving cultural "laws" with universal applicability (Binford 1962, 1965, 1972; Schiffer 1972, 1976; Woodall 1972; Watson et al. 1971; Fritz and Plog 1970). This "new" or "processual" archeology does not necessarily stand in diametric opposition to the "traditional" approach, but instead complements and expands on the models of its predecessor. Discernment of the diachronic changes that occurred in prehistoric settlement-subsistence patterns must acknowledge the utility of the original chronological data in combination with more recent, often highly specialized analytic tools (cf. Hayden (ed.) 1979; Schiffer (ed.) 1978, 1979). Of course, there were antecedents to the "new" methods of inquiry, since the archeology of the 1940s, 1950s and early 1960s rarely was concerned exclusively with chronological and spatial orderings or the compilation of trait lists. Earnest attempts were made to elucidate the cultural-ecological relationships that are so avidly pursued today. Along this line, it is instructive to compare the methods of Caldwell (1958), Griffin (1946) and Williams and Stoltman (1965), for example, with the more recent investigations of Gardner (1974), Carbone (1978), Goodyear et al. (1979) or Custer (1978).

Archeologists are involved in constant processes of reinterpretation and reevaluation of each other's methods and findings, and what is labelled "new" archeology often obtains merely from the application of new tools (edge-wear studies, paleoenvironmental reconstruction, statistical demographic analysis, etc.) to the same categories of archeological phenomena. This confusion between the methods and goals of the "old" and "new" archeology has been succinctly addressed by Walter Taylor (1972) as "old wine and new skins", a situation he anticipated some years earlier (Taylor 1948).

The overview of Piedmont prehistory offered here naturally draws heavily from the research of Coe, especially the 1964 publication. Other syntheses presented by Sears (1964), Griffin (1952, 1967) and Dragoo (1976) have been considered as well, although they are more general in scope. More detailed and regionally-specific reviews of Piedmont archeology have been offered recently (Goodyear et al. 1979; Taylor and Smith 1978; Gardner 1974) and help form the basis for this chapter and many of the research directions and interpretations offered elsewhere in this report. Topic-specific references are cited as necessary in the following text.

The format is similar to that recently presented by Goodyear (Goodyear et al. 1979). A general discussion is made for each cultural-historical division which includes: 1) relevant chronological data, derived from comparisons of typological, stratigraphic or radiometric evidence from various Southeastern sites; 2) information on the assemblages associated with each period or stage, particularly as they reflect cultural-ecological adaptations; and 3) current interpretations of settlement/subsistence patterns in light of changing natural and cultural environments of the last 10-12,000 years.

Figure 3.1 is provided as a general guide to current understanding. It summarizes the text, particularly regional or site-level information on stratigraphic and absolute dating contexts for widespread cultural or technological regularities (cf. Tuck 1974; Chapman

1976; Broyles 1971; Coe 1964). Figure 3.2 shows the locations of several important archeological sites discussed in the following text. It also outlines major physiographic zones of the southeastern United States.

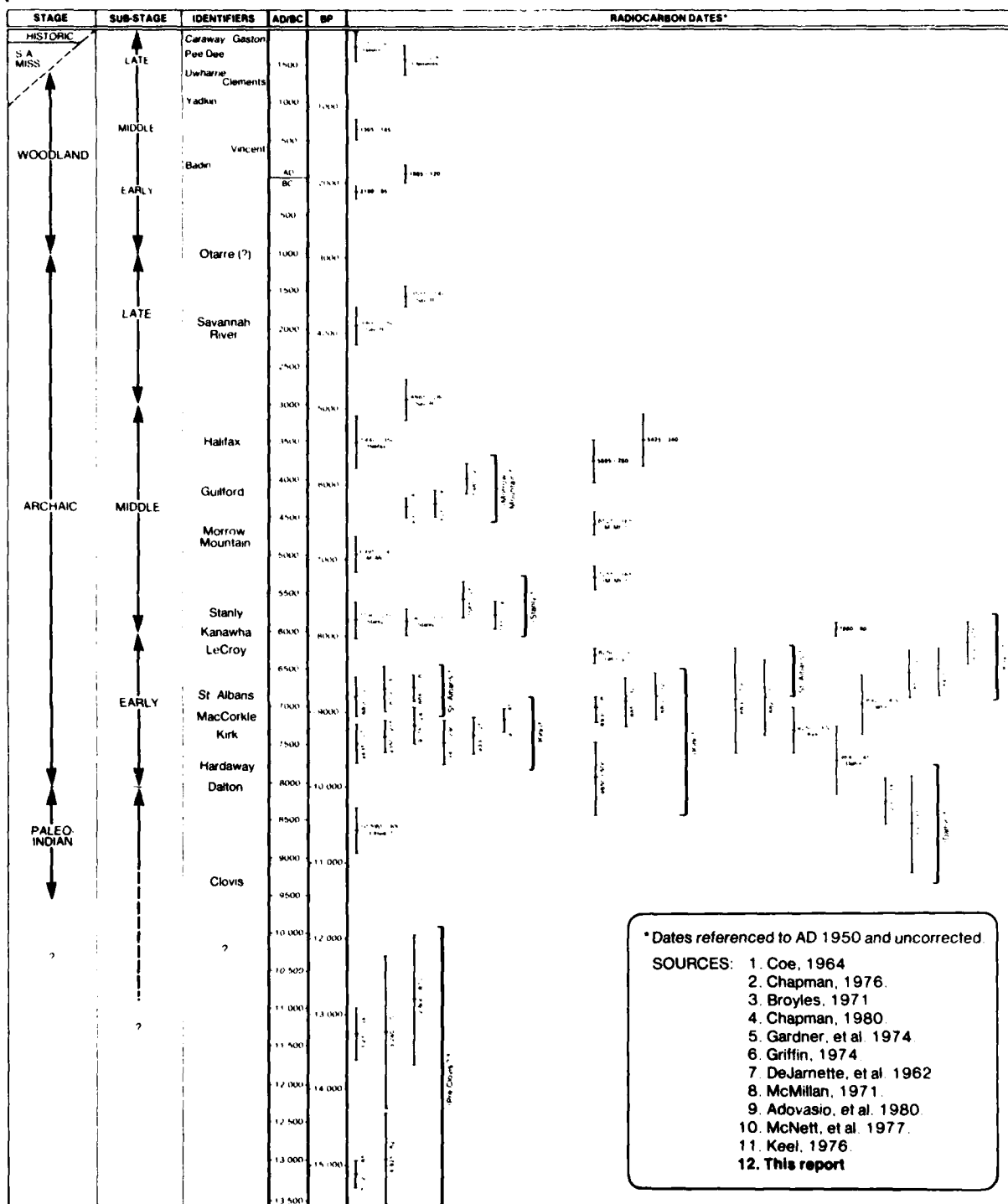
Pre-Paleo-Indian Stage

An important debate in American archeology concerns the possibility of New World occupation prior to the late Pleistocene Paleo-Indian period, beginning ca. 11,500 B.P. Without delving into the environmental mechanics of Beringia and late Pleistocene glacial patterns, we feel that this shadowy area merits at least brief consideration since it is being increasingly publicized, even in nonprofessional formats (Canby 1979).

The greatest impetus for discussion of a "pre-Clovis" (Goodyear et al. 1979) or "pre-projectile point" cultural-technological stage has come from the writings of Alex Krieger (1962, 1964). A number of sites in North and South America have produced archeological materials dated, with varying degrees of exactitude, to thousands of years before accepted dates for Paleo-Indian Clovis or Sandia horizons (Wormington 1957; Sellards 1952; Willey and Phillips 1958; Haynes 1971; Krieger 1964). Real or supposed associations of human artifacts or skeletal remains with extinct fauna or geologic formations have been bolstered with radiometric or other chemical-physical dates that far exceed the normally accepted time range for Paleo-Indian specimens. Other archeologists are adamantly opposed to the idea of a pre-Paleo-Indian stage, preferring to dismiss potential evidence for its existence in eastern North America as "examples of wishful thinking" (Griffin 1978:57). Some prefer more simply to defer judgment until better data are revealed or more sophisticated techniques are applied to available data (Caldwell and Henning 1978:118).

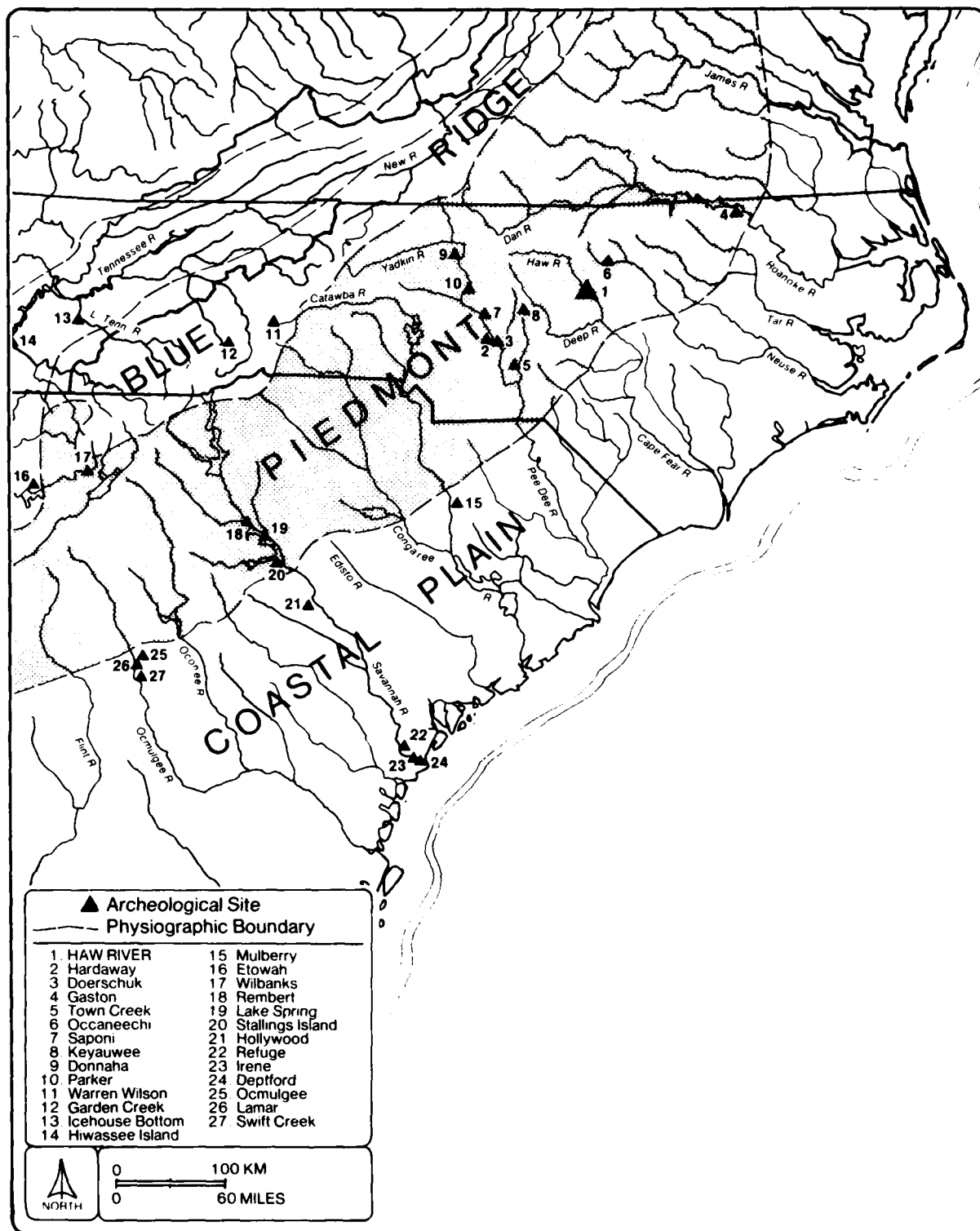
Examples of Krieger's "Pre-Projectile Point" stage include sites typified by a "low level of stone-working technology" with all objects "made by percussion only." He further compares it to the Lower Paleolithic of Old World archeologists (1964:42). Four archeological sites identified by Krieger as representative of this stage are: Lewisville, Texas (> 38,000 years B.P.); Tule Springs, Nevada (> 28,000 B.P.); Santa Rosa Island, California (10,000-29,500 B.P.); and Scripps Campus, California (ca. 21,500 B.P.) (Krieger 1964: Table 1 and pp. 45-46). All of these sites are associated with extinct Pleistocene faunas, as are several others that he identifies as "pre-projectile point" but which lacked radiometric dates at the time of his writing (see also Wormington 1957; Sellards 1952; Krieger 1962). At least one of those sites (Lewisville) has recently yielded more acceptable Clovis-period dates, weakening Krieger's argument to a certain degree (J. Ned Woodall, personal communication 1980).

Researchers in this problematic area of New World archeology have argued also, on more conjectural grounds perhaps, that recognized antecedents for Paleo-Indians are necessary, due to a need for preexisting populations and technologies responsible for the *in situ* development and distribution of the highly distinctive and specialized Paleo-Indian tool kit (Mason 1962:245; Byers 1962:250; Jelinek 1962:255; Krieger 1964:26). This recurrent line of reasoning also follows from the apparent lack of a clearly defined technological or



DATA RECOVERY AT SITES 31CH29 & 31CH8
B. EVERETT JORDAN DAM & LAKE
CHATHAM COUNTY, NORTH CAROLINA
COMMONWEALTH ASSOCIATES, INC.

FIGURE 3.1
GENERAL CULTURAL-TEMPORAL
FRAMEWORK OF PIEDMONT
ARCHEOLOGY



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA

COMMONWEALTH ASSOCIATES, INC.

FIGURE 3.2
SELECTED
ARCHEOLOGICAL SITES &
PHYSIOGRAPHIC BOUNDARIES-
SOUTHEASTERN UNITED STATES

stylistic link (particularly, the technique of "fluting" projectile points) between Siberian Upper Paleolithic and North American Paleo-Indian sites (Mason 1962; Williams and Stoltzman 1965; Krieger 1964; Griffin 1960; Giddings 1960).

While the previously-mentioned sources identify several archeological manifestations of this stage in the New World, there exists very little real or supposed evidence for pre-Paleo-Indian occupations of the southeastern United States. Dragoo (1976:5-8) is a major proponent for the recognition of a "Lower Early Lithic" stage in eastern North America, based primarily on his own investigations at Wells Creek, Tennessee, and his analysis of the "Lively Complex" pebble tool assemblages from Alabama (see also Dragoo 1965, 1973; Lively 1965, Josselyn 1967). There can be no question of the antiquity of pebble tools, bifacial and polyhedral cores in the Southeast; their co-occurrence with Paleo-Indian remains in the East, as at Debert (MacDonald 1968, 1971) and Wells Creek is undeniable. However, Dragoo fails to offer concrete evidence of their antiquity and possible contemporaneity with early "chopper-chopping tool" complexes of southeast Asia. While admitting that pebble tools, in particular, are persistent elements of all lithic assemblages, Dragoo can offer no more substantive arguments than "how much older than Clovis they [the pebble tools] may be is yet to be determined, but on the basis of typology and weathering the time may be great", or "the variety and range in these tools from small to large also indicates that we may be dealing with a discrete cultural complex of great antiquity and persistence" (Dragoo 1976: 7). It is exactly this type of inferential reasoning that has made counterarguments of Griffin (1960:5, 1978:57) and others so difficult to deny.

Since the writing of most previously-cited articles, (Griffin's 1978 summary being submitted in 1973), there has emerged new evidence for a "pre-Clovis" (Goodyear et al. 1979), although not a "pre-projectile point" stage in eastern North America. The Meadowcroft Rockshelter, in southwestern Pennsylvania, contains a stratified, well-preserved collection of artifacts and debris that span the last 16-19,000 years (Adovasio et al. 1977, 1978). The earlier elements of the Meadowcroft sequence are of primary interest to this discussion, because they have yielded a sophisticated lithic assemblage of bifacial and unifacial tools, which may actually represent the precursor of fluted point industries in North America (Adovasio et al. 1978:650). Tools from Stratum IIA include blade-like flakes, graters, marginally-retouched "Mungai" knives, miscellaneous bifaces and an unfluted lanceolate biface or projectile point (Adovasio et al. 1977:645-648).

The Meadowcroft investigators have recognized the *absolute* necessity for multidimensional documentation of claims for pre-Paleo-Indian occupations, including stratigraphic control over artifacts directly associated with several radiocarbon dates. Even Griffin, as one of the more outspoken skeptics of a pre-Paleo stage, has implied his conversion if those conditions are met:

If a clearly defined cultural complex is radiocarbon dated and is in agreement with the correct geological formations and faunal associations, then certainly the majority of American archeologists will be willing to accept such evidence (Griffin 1960:5).

The Meadowcroft data appear to meet these stringent criteria, as Stratum IIA artifacts have been radiocarbon dated to at least 16,000 B.P. and possibly as much as 19,000 B.P. Charcoal lenses in deeper, nonartifact strata also have yielded dates in the 21-28,000 year range (Adovasio et al. 1978: Table 2).

Gardner (1980), Mead (1980) and Haynes (1980) have recently discounted such claims of antiquity for the Meadowcroft data; Gardner provides no documentation for his opinions, while Mead and Haynes object on technical grounds concerning faunal associations, geomorphology and radiocarbon contamination. The Meadowcroft investigators have replied to the substantive criticisms by re-emphasizing their original interpretations and denying the possibilities of carbon contamination (Adovasio et al. 1980). As it now stands, the data from Meadowcroft remain highly controversial yet appear to defy serious refutation pending final data analysis and review.

Paleo-Indian Stage

The Paleo-Indian occupation of eastern North America has traditionally been defined on the basis of fluted lanceolate projectile points and real or assumed associations of early man with extinct forms of late Pleistocene megafauna (mammoths, mastodons, giant sloths, camels, horses and giant bison). Paleo-Indian sites have been consistently dated by archeologists to a period of 11,500 to 10,000 years B.P. and are commonly accepted as the earliest signs of human occupation in the New World (Griffin 1967, 1978; Mason 1962; Sellards 1952; Wormington 1957; Williams and Stoltman 1965). Paleo-Indian sites have been identified from most regions of North and South America and exhibit a remarkable consistency in artifact variability, if not settlement-subsistence orientation.

Isolated finds of the distinctive fluted points are fairly common in eastern North America (Mason 1962). But until fairly recently, archeological knowledge of Paleo-Indian adaptive systems was only partially defined through excavation of big game "kill sites" in the Plains and Southwest (Frison 1978; Wormington 1957). The overwhelming trend in eastern Paleo-Indian studies has remained on the level of distributional studies, generally the isolated point finds characteristic of the area (Mason 1962; Williams and Stoltman 1965; Michie 1977; Rolingson 1964; Perkinson 1971, 1973). Those studies generally agree that early occupations tend to be concentrated within major river drainages, whether in the interior plateau regions, the mountains, or the Atlantic Slope. Several formal variations in projectile points can be recognized which appear to have constrained distributions; they may presage the artifactual, if not cultural regionalization characteristic of the later Archaic stage (Williams and Stoltman 1965; Mason 1962; Fitting 1968).

More substantial documentation of eastern Paleo-Indian occupations has resulted from the discovery and excavation of sites producing more varied tool assemblages and concrete evidence for intrasite artifact patternings. Analysis of those site data has allowed reconstruction of group activities and habitation patterns. Important sites in this regard include Shoop, Williamson, Quad, Bull Brook, Debert and Holcombe Beach (McCary 1951; Witthoft 1952; Soday 1954; MacDonald 1968; Fitting et al. 1966; Byers 1954; Wilmsen 1970).

Archeologists who have studied eastern Paleo-Indian remains have generally assumed, until fairly recently, that subsistence activities were directed toward pursuit of Pleistocene megafauna. Authors of the previously cited survey and excavation reports either explicitly or implicitly attempt to demonstrate close parallels between eastern Paleo-Indian subsistence strategies and those witnessed in the western states by mastodon, bison, horse or camel "kill" sites (Frison 1978). While parallel artifact forms and radiometric dates characterize both eastern and western sites, actual associations of eastern Paleo-Indian sites with megafaunal remains are entirely inferential, or at best, poorly documented (Williams and Stoltman 1965; Williams 1957; Haynes and Hemmings 1968; Jenks and Simpson 1941; Kraft and Thomas 1976; McMillan 1976).

At least three sites in eastern North America — Debert, Holcombe Beach and Dutchess Quarry Cave — have yielded good evidence for Paleo-Indian exploitation of woodland or barren-ground caribou (Cleland 1965; Funk 1977; MacDonald 1968). As those sites were probably situated in periglacial environments during the periods of occupation, the data are not entirely surprising; extension of an analogous hunting pattern to the Southeast may stretch the limits of feasibility, however, and should be made only with extreme caution (Gardner 1974). In point of fact, the least problematic data from eastern U.S. sites currently suggest that Paleo-Indian hunting strategies targeted on basically modern faunal assemblages, particularly white tail deer (Adovasio et al. 1978; note also Byers 1962:248, who argues that deer made up a significant portion of the faunal remains at Bull Brook). Paleoenvironmental and paleofaunal reconstructions further strengthen these interpretations by demonstrating the potentiality and presence of "modern" game well into the accepted time range for Paleo-Indians (Carbone 1974; Watts 1980; MacDonald 1971; Fitting 1968).

Recent investigations of eastern Paleo-Indian sites have continued to provide data on settlement-subsistence patterns (Gardner 1974; McNett et al. 1977; Adovasio et al. 1978; Moeller 1980). Such detailed studies of site and assemblage variability have provided additional documentation of Paleo-Indian groups as small, probably kin-related bands who led a seminomadic existence dependent on the seasonal availability of game and other resources. Other than hunting, wild plant food gathering and perhaps fishing also formed important subsistence tasks, beginning a pattern that greatly intensified during the ensuing Archaic stage (McNett et al. 1977).

With rare exceptions, our knowledge of Paleo-Indian material culture is limited to stone tools, the fluted point being the most easily recognized. Low population densities and low energy capturing potential also contribute to our assumptions that Paleo-Indian tool kits may have been limited to only the most basic hunting, butchering, processing and maintenance implements. Excavated sites like Meadowcroft Rockshelter, Debert and Thunderbird provide ample evidence for a simple, yet highly efficient chipped stone tool kit of projectile points, bifacial knives, hide scrapers and bone- and woodworking tools. Perishable materials such as wood, leather, bone and cordage have not survived, although tantalizing evidence for bone points, wooden throwing sticks and other implements has been found under rare circumstances (Jenks and Simpson 1941; Clausen et al. 1979).

Several authors, particularly Gardner (1974), Wilmsen (1970) and Goodyear (1979) have noted the marked preference for high quality cryptocrystalline lithic raw materials in Paleo-Indian tool assemblages. Several explanatory models have been constructed to account for this phenomenon, including intergroup trade, seasonal mobility with recurrent exploitation of select outcrops or more stable settlement systems "tied" to major sources of high quality material. Whatever the mechanism, a defensible argument can be made (Goodyear 1979) for conscious selection by Paleo-Indians for high quality materials. If current ideas of small group size, high mobility and technological efficiency among those groups are correct, then an easily maintained tool kit would have been of central importance for the continued viability of the Paleo-Indian settlement-subsistence pattern.

Archaic Stage

The Archaic stage encompasses the longest span of time for the four major periods of eastern North American prehistory. The beginnings and endings of this cultural-historic-technological stage can be defined only in the most general terms, and with the most general dates. But certain (dynamic) continuities in subsistence technologies, settlement patterns, and, perhaps, social organization and belief systems appear to characterize the long period from 10,000 to around 3000 B.P. in eastern and southeastern North America. From the onset of modern Holocene climatic conditions, we can recognize very gradual shifts in lithic technology, subsistence orientations and settlement systems away from the late Pleistocene Paleo-Indian traditions. The next 7000-odd years witnessed variable rates of change and development in each of several cultural substages, culminating (if that word can be assumed an accurate descriptor) in the Woodland stage, although the actual mechanisms and dates for that latter transition are among the most problematic elements of American archeology.

The concept of a pre-pottery, pre-agricultural, pre-burial mound Archaic stage has developed gradually only during the last 50 years (Ritchie 1932) and especially the last 30 years (Byers 1959; Caldwell 1954, 1958; Kelly 1954; Kneberg 1954; Webb 1964; Webb and DeJarnette 1942; Schmitt 1952; Coe 1952). Prior to the introduction of radiocarbon dating, archeologists had little appreciation for the time depth involved for an "archaic" stage, but realized that pre-ceramic horizons were quite common in North America and differed markedly from the later Woodland and Mississippian stages on "trait list" and taxonomic grounds (Byers 1959). In fact, a very significant portion of the money and labor allocated to the massive WPA, TVA and other federal archeological programs of the 1930s and 1940s was devoted to recovering data from Archaic sites (cf. Webb 1938, 1939; Webb and DeJarnette 1942; and others), in part to resolve the chronological and technological problems they engendered.

Radiocarbon dates, in combination with the discovery and excavation of several deeply-stratified sites, led to partial resolution of the Archaic "identity crisis" during the 1950s and early 1960s. Closed, protected sites such as Modoc Rock Shelter (IL) (Fowler 1959), Graham Cave (MO) (Logan 1952) and Russell Cave (AL) (Griffin 1974) and open, alluvially-sealed sites like the Doerschuk, Hardaway and Gaston (NC) sites (Coe 1964) provided long, interposed sequences of cultural materials and associated radiometric dates.

Those excavated data provided needed chronological controls and continue to serve as the basis for many current interpretations of Archaic stage technologies and settlement-subsistence patterns. The research, of course, is an ongoing process and more recent investigations are supplementing the original data base; particular references will be cited in the following discussion.

The Archaic stage is generally regarded as a period of adaptation to Holocene environments and regionalization of specialization as various aboriginal groups expanded into and became familiar with new territories and their resources (Caldwell 1958). Archeologically, this trend manifests itself by increased diversity in tool forms both on interregional and intraregional scales. Within the largest context of an Archaic technological or temporal stage, there exist certain developmental and adaptational trends that can be grouped for discussion purposes into Early, Middle and Late Archaic periods or substages (Griffin 1967). Temporally, those divisions can be roughly identified as follows: Early Archaic - 8000-6000 B.C.; Middle Archaic - 6000-3000 B.C.; Late Archaic -3000-1000 B.C. (Figure 3.1).

No abrupt boundaries can be drawn between substages preceding or following others; very real technological and (we presume) cultural continuities were present. But, as the following discussion indicates, each substage demonstrates some internal cohesions that lend themselves to the archeological scheme we follow here.

Early Archaic

The simplest, and most commonly accepted, concept of an Early Archaic substage involves the recognition of a technological and subsistence economy shift away from the Paleo-Indian "big game hunters" of the late Pleistocene. The change coincided with the onset of Holocene climatic conditions and establishment of essentially modern biotic communities. An Early Archaic substage is assumed to mark the inception of a long tradition of mixed hunting and gathering and a system of group translocations for efficient exploitation of seasonally available vegetable or animal foods (Caldwell 1958).

Under closer scrutiny and with the addition of recent site data, it has become increasingly apparent that any clear divisions between late Paleo-Indian and Early Archaic are more imagined than real. Since analyses of the problem have had to proceed on the basis of surviving data classes, most Early Archaic studies focus on stone tool assemblages. Investigators have demonstrated both stratigraphically (Coe 1964; Adovasio et al. 1978; Gardner 1974), typologically (Goodyear 1974; Coe 1964; Broyles 1971; Tuck 1974) and through distributional studies (Williams and Stoltman 1965; Rolingson and Schwartz 1966; Wright 1978) that "Paleo-Indian" and "Early Archaic" bands used similar tool forms, exploited similar ecozones and perhaps, were even contemporaneous inhabitants of a changing environment. The idea of contemporaneity is not a new one (Rolingson 1964) and remains a viable argument on certain grounds (Bryan 1977). Predictably, not all archeologists concur on such matters and argue with equal conviction that very marked differences existed between Paleo-Indian and Early Archaic technologies and settlement systems (Gardner 1974).

For taxonomic and discussion purposes, however, it is useful to define Early Archaic on the basis of identifiable typological elements. Researchers have pointed out the essential similarity between Paleo-Indian and the earliest Archaic tool kits; both contain relatively constant elements of hafted, bifacial projectile points (or knives), and a variety of end-scrapers, graters or other tools made on rather large prismatic flake blades (Goodyear 1974; Wilmsen 1970; Gardner 1974; Adovasio et al. 1977). Tuck (1974), Fitting (1964), Chapman (1976) and others have monitored a continuing modification of the basic tool kit and its elements (especially hafted bifaces) through the Early Archaic by identifying "horizons". Each horizon, named after distinctive, associated forms of hafted bifaces, is meant to identify broad, extraregional stylistic or technological continuities within a period when Archaic stage regionalization had its beginnings (Tuck 1974; Chapman 1975).

The four horizons which comprise the Early Archaic substage are: Dalton (ca. 8000-7000 B.C.); Big Sandy (ca. 8000 B.C. (?)); Kirk (ca. 7500-6000 B.C.); and Bifurcate (6700-6000 B.C.). The specific biface forms that identify each horizon demonstrate a clear morphological trend. Lanceolate, basally thinned or fluted Dalton variants closely resemble the fluted Paleo-Indian Clovis variants. Successive horizons of Big Sandy and Kirk exhibit side and corner-notching, more trianguloid blade forms and reductions in the frequency of grinding of haft elements. The Bifurcate variants of MacCorkle, St. Albans, LeCroy and Kanawha types are further transitional toward the stemmed point forms characteristic of Middle Archaic assemblages in much of the Southeast (Chapman 1976; Broyles 1971). Each successive horizon appears to manifest increasing numbers of regionally variant point forms, subsumed under the horizon "type", as well as increased diversity of tool forms other than hafted bifaces (Coe 1964; DeJarnette et al. 1962).

Goodyear (et al. 1979) has recently summarized much of the available data on Early Archaic occupations in the Piedmont as they reflect the larger pattern evident in eastern North America. Particular emphasis is placed on the Dalton horizon and the significance of Coe's Hardaway sequence. Even within that earliest horizon Goodyear identifies decreasing technological similarities between Clovis, Dalton and Hardaway point forms and increasing regionality, evidenced by Hardaway side-notched points in the North Carolina Piedmont which are rare or nonexistent in South Carolina (Goodyear et al. 1979). Side-notched Hardaway points in North Carolina may in fact mark the further transition to Kirk (or, locally, Palmer) corner-notched forms, since the Big Sandy points found elsewhere in stratigraphic juxtaposition with Dalton remains (DeJarnette et al. 1962; Griffin 1974) are absent in the Piedmont (Taylor and Smith 1978; Anderson et al. 1979; Coe 1964).

As noted previously, Early Archaic sites occur in many of the same environmental settings as older Paleo-Indian sites, especially along major river drainages. However, as befits a transitional period of changing environmental variables and perhaps population increases, it also is clear that Early Archaic activity or habitation sites are preserved in other localities as well — specifically, upland interriverine sites and caves or rockshelters (Goodyear et al. 1979; Ahler and McMillan 1976; Coe 1964; Logan 1952; Fowler 1959; Griffin 1964;

DeJarnette et al. 1962). Whether this indicates a major shift in settlement patterns (Morse 1973; Michie 1977; Gardner 1974) or simply an expansion into the "hinterlands" is a question that cannot as yet be answered.

Goodyear (et al. 1979) makes an argument for a major shift based on the fact that Dalton remains are the earliest in any of several long stratigraphic sequences from cave or rockshelter sites in the Southeast; Clovis remains have never been found in lower levels. Paleo-Indian and Archaic remains are stratified in several open sites, however, including the Bull Brook (Byers in Fowler 1959), Thunderbird (Gardner 1974) and, possibly, Quad (Cambron and Hulse 1960) sites. At least one instance of late Paleo-Indian artifacts in context with Early Archaic materials has been reported from the Flint Creek rock shelter in Alabama (Cambron and Waters 1959, 1961).

Goodyear also ignores one of his own demonstrations, that many Early Archaic hafted bifaces are, in fact, hafted knives (Goodyear 1974) and not true projectile points like their fluted predecessors. Hafted knives may be present in rockshelter or cave sites due to their use in certain activity sets (Ahler 1971), while fluted forms are absent because they fulfilled entirely different functional roles in Paleo-Indian subsistence-settlement systems. While the identification of tool function (piercing, cutting, sawing, etc.) has received much attention in the literature (Ahler 1971; Ahler and McMillan 1976; Goodyear 1974) the fact that some point forms served several activity roles complicates the issue even further. However, mere absence of a tool form in a particular, specialized context cannot be used as evidence to rule out the possibility for its use in the area or the existence of analogous tools within the same system. Nonhafted cutting tools like the "Mungai knives" at Meadowcroft Rockshelter (Adovasio et al. 1978) may have served as the Paleo-Indian cutting tool correlates to Early Archaic hafted bifaces (also see Frison 1978). Upland Paleo-Indian sites are present, and while they may lack the archeological visibility of floodplain or rockshelter sites, they do witness exploitation of environmental zones that were also inhabited, perhaps on a more intensive basis, by Early Archaic groups.

Early Archaic horizons following the Paleo-Indian - Dalton (and, possibly, Big Sandy) transition include Kirk and Bifurcate (Tuck 1974; Chapman 1975). Although stratigraphic and temporal separations of lanceolate Dalton and side-notched Big Sandy forms remain problematical, clear demonstrations exist for divisions between the two latter horizons (Coe 1964; Chapman 1975; DeJarnette et al. 1962; Griffin 1964; Gardner 1974).

Since their initial recognition as an Early Archaic type or horizon marker at the Hardaway site (Coe 1964), various corner-notched points in the Kirk "tradition" or "cluster" have been identified as a widespread phenomenon. Many regional variants have been named, but Kirk points are recognizable in excavated or surface collected Early Archaic assemblages throughout North America east of the Mississippi River (Griffin 1964; Broyles 1971; Ritchie and Funk 1971; Dincauze 1976; Bullen 1968; DeJarnette et al. 1962; Wright 1978; Lewis and Lewis 1961). Technological attributes shared with earlier Dalton (Hardaway) forms such as bevelled and serrated blade edges (products of resharpening) and grinding of haft

elements constitute a continuum in manufacturing techniques, while the tendency toward more triangular blade shapes and an absence of basal fluting demarks a gradual attenuation of the older techniques (Gardner 1974; Goodyear et al. 1979).

Basal grinding and generally smaller size points have until recently been considered defining for the earliest Kirk forms in the Piedmont, locally called Palmer (Coe 1964; Taylor and Smith 1978; House and Ballenger 1976; Goodyear et al. 1979, 1978; Cable et al. 1978). Metric attribute analyses of recently excavated specimens, however, indicate that neither basal grinding as a functional or stylistic attribute, nor size appear to be significant measures of temporal precedence (Chapman 1975; Broyles 1971; this report); Palmer points probably represent either different stages in the use-life of more typical Kirk points or were minor regional variants of the more common forms.

In his original analysis of Early Archaic cultural-technological stages at the Hardaway site, Coe distinguished between morphological and stratigraphically separate variations in Kirk point forms, specifically corner-notched, stemmed and serrated (Coe 1964:70). While there is some continuity in that sequence, it now appears from more recent investigations (Chapman 1975, 1977, 1979) that: 1) morphologically, the latter two forms more closely resemble the stemmed biface forms characteristic of a Piedmont early Middle Archaic (Stanly) tradition; 2) technologically, the differences between Kirk stemmed and serrated may be only the results of edge rejuvenation; and 3) a biface hafting technique called bifurcation probably intervenes between Kirk notched and stemmed forms as an intermediate variety. Bifurcate base points were, however, either absent or unrecognized in the Hardaway site sequence as reported in 1964, although they do occur elsewhere in the Piedmont (Chapman 1975; Claggett et al. 1978; Taylor and Smith 1978).

The technique of biface haft element bifurcation identifies the final horizon of the Early Archaic substage in eastern North America (Chapman 1975; Fitting 1964), which has its own demonstrated internal variability in terms of biface morphology (Chapman 1975, 1977, 1978, 1979; Broyles 1971). Successive phases are identified by typical point forms called MacCorkle, St. Albans, LeCroy and Kanawha, which constitute a technological and morphological transition from corner-notched Kirk forms, into the stemmed Stanly "cluster" of the early Middle Archaic substage (Chapman 1975, 1978).

Chapman (1975) has prepared a comprehensive study of the Bifurcate tradition, noting its apparent distributional correspondence with the eastern deciduous forest and restricted temporal span of ca. 6800-6000 B.C. A settlement model is proffered, based on Chapman's analysis of the distribution of sites throughout the East that produce bifurcate base points. It basically confirms a generalized Early Archaic substage pattern of multifamily base/camps in riverine bottomland settings, supported logistically by smaller extractive (hunting, gathering, quarrying and perhaps fishing sites) in the general environs.

Chapman also has revealed, through excavation of several Early Archaic sites in the Little Tennessee Valley, that Caldwell's idea of "primary forest efficiency" as a later Archaic

phenomenon should be reevaluated. Besides hunting and butchering implements, Chapman has demonstrated that relatively intensive occupations of riparian sites occurred during the Early Archaic and were supported by intensive and efficient gathering of plant foods (hickory nuts and acorns) in addition to wild game. Nevertheless, Caldwell's earlier concept of a broad-based economy, incorporating a wide variety of plant and animal species remains basically unchallenged, if detailed paleobotanical reconstructions elsewhere are correct (Asch et al. 1972).

Additional data on Early Archaic subsistence patterns can be gleaned from various sources, but allowing for the vagaries of preservation conditions, usually concentrate on animal exploitation patterns (McMillan 1971; Parmalee et al. 1976; Parmalee 1962; Weigel et al. 1974). Those studies list a variety of small game species that were consumed, including: raccoon, beaver, groundhog, rabbits, relatively large numbers of grey squirrels, turtles and various bird species. The main protein source, however, seems to have been white-tailed deer. Most studies of Early Archaic technological and settlement patterns are based on the assumption that deer were the major big game target during the transition from Paleo-Indian to more fully developed general economies of the Middle Archaic substage (Goodyear 1974; Ahler 1971; Morse 1969, 1977; House and Ballenger 1976; Luchterhand 1970; Raab 1976).

As a transitional period, both environmentally and culturally, the idea of Early Archaic economies focusing (to use Cleland's 1976 terminology) on white-tailed deer as the major protein source is not unexpected, and perhaps predictable. Early Archaic tool assemblages contain significant percentages of piercing, cutting and scraping tools suitable for hunting-related activities. Other tools, presumably useful for plant processing (i.e., pitted and edge ground cobbles, manos, etc.) are present also, and may indicate a developing reliance on nongame resources.

Middle Archaic

The Middle Archaic substage can be identified on several grounds: stylistically, with a preponderance of stemmed projectile point forms; technologically, since ground stone tools become important elements of assemblages; environmentally, as the Middle Archaic period coincides with the establishment of modern plant community ranges and sea level adjustments; and culturally, with establishment of the regionalized patterns of intensive resource exploitation that characterize Archaic stage economies as a whole.

Cohen (1977) views the Middle Archaic as the first clear trend toward "broad spectrum exploitation," following the intensively hunting oriented cultures of the Paleo-Indian and Early Archaic periods. Similar economic characterizations can be found in Caldwell (1958), Cleland (1976) and others. Intensification and stabilization of residential patterns apparently went hand in hand with "broad spectrum" or "diffuse" economies if numbers of sites, depths of midden accumulation and variety of occupied econiches are accurate indicators (Caldwell 1958; Rolingson 1967; Lewis and Lewis 1961; Houart 1971).

Reductions in seasonal group mobility and consequent constraints on group interactions may also be reflected in changes in lithic raw material preference patterns. Goodyear (1979), Gardner (1974) and others have noted a marked decrease in the use of high grade cryptocrystalline materials coincidental with changes from Early Archaic to Middle Archaic tool assemblages.

While hunting of deer, turkey, raccoon and other animal species continued to be important, Middle Archaic sites throughout the southeast demonstrate that subsistence patterns were also oriented toward gathering local, nongame resources. Midden accumulations, up to several meters thick at some riparian sites, are fairly typical Middle Archaic occurrences; their high proportional content of bivalve and univalve mollusc shells and charred nut remains, along with the usual complement of mammal and bird bone, provides firm evidence for broad base subsistence strategies (Asch et al. 1972; Rolinson 1967; Webb 1974; Winters 1974; Parmalee et al. 1976; Morse 1967). Less direct evidence for increased use of nongame food sources during the Middle Archaic can be seen in the frequencies of plant processing tools like milling stones, pestles, "nutting stones" and the like (Winters 1974). Technologically, the addition of those items and other ground stone tools, such as atlatl weights, to Middle Archaic assemblages helps mark the division from the Early Archaic.

Several phases, named after characteristic point forms, can be identified for the Middle Archaic in the Southeast, although they do not exhibit the widespread nature of Early Archaic horizons discussed previously. The successive Stanly, Morrow Mountain and Guilford phases are commonly identified by archeologists as the major Middle Archaic occupations in the Piedmont, Coastal Plain and Blue Ridge regions (Goodyear et al. 1979; Taylor and Smith 1978; Phelps 1980; Purrington 1980; Keel 1976). The point forms defined originally by Coe (1964) at the Doerschuk and Hardaway sites in North Carolina are recognized elsewhere (Holland 1970; Cambron and Hulse 1964; DeJarnette et al. 1962; Lewis and Lewis 1961; Griffin 1974; Gagliano et al. 1977). It seems risky, however, to identify taxonomic phases which may be peculiar to the Piedmont in areas where there clearly exist other distinguishing point forms, if not cultural adaptational patterns (cf. Phelps 1964).

As discussed earlier, certain trends in hafted biface morphology continue into the Middle Archaic substage, as Stanly and Morrow Mountain varieties continue the tradition of stemmed points that began in the Early Archaic. Stanly points are identified by fairly broad, triangular blades and short, square stems with small basal indentations. Morrow Mountain points are also stemmed, with two varieties (Types I and II) identified by Coe (1964) on the basis of stem shape (rudimentary versus acutely contracting) and reduction in blade width. Morrow Mountain Types I and II were also distinguishable stratigraphically at the Doerschuk site, but not at the Hardaway or Gaston sites (Coe 1964). Morrow Mountain I variants constitute important Middle Archaic components of the Howard and Icehouse Bottom sites in eastern Tennessee (Chapman 1979); Morrow Mountain II variants are rare, however.

Guilford points, on the other hand, present a potentially anomalous situation in the overall Piedmont sequence. Although some specimens exhibit vestigial stems, or at least weakly developed shoulders above the haft element, the majority are regularly lanceolate in outline, as noted by Coe in his original type description (1964:43). Other characteristics include a distinctive form of bifacial thinning or resharpening that resulted in thick lenticular or diamond-shaped cross sections. The overall effect of Guilford point manufacture and maintenance techniques is a thick, lanceolate bifacial cutting or piercing implement that apparently interrupts the Archaic developmental trend from notched to stemmed points. Guilford type points are even more enigmatic when the large, stemmed Savannah River forms of the Late Archaic substage are considered as a return to the larger Archaic morphological and technological continuum.

A fourth type of Middle Archaic point was defined by South (1959) and Coe (1964) from the Roanoke River basin. Halifax points are thick, straight-based and shallowly side-notched. Their relatively crude workmanship may be a reflection of prehistoric raw material selection or availability, since the majority recovered at the Gaston site were made of quartz or quartzite. As Coe (1964:109-110) notes, Halifax points are more typically elements of Archaic sites in the Middle Atlantic seaboard region (Holland 1955, 1960; Miller 1962; Stephenson and Ferguson 1963). Halifax points are occasional elements of Carolina Piedmont sites, however, in association with the more common Morrow Mountain and Guilford types.

The diversity of Piedmont Middle Archaic bifaces and other changes in the stone tool assemblages have excited no small attention among some archeologists, particularly since the Middle Archaic may have been coincidental with a climatic period of increased dryness called variously the Altithermal, Hypsithermal or Climatic Optimum. Coe (1964) hinted at a possible western North America origin for Morrow Mountain and Guilford biface forms, reflecting some of the then-current data from sites like Modoc Rockshelter and Graham Cave (Fowler 1959; Logan 1952) which suggested eastern extension of prairie environments during the Middle Archaic. Certain vegetational changes may have occurred in the West and Midwest during this time period, due to minor temperature and precipitation fluctuations (Reeves 1973; McMillan 1976) which had cultural implications; for the Southeast, however, the fossil record is more ambiguous. Goodyear (et al. 1979) has summarized some of the data on apparent changes in Middle Archaic subsistence and technology, but admits that no firm evidence exists for a major climatic shift. The extreme conditions implied for a Southeastern Altithermal as a major shaper of Middle Archaic culture history through a "Western Intrusive Horizon," as once advocated by Phelps (1964), appear indefensible in light of current information (Cridlebaugh 1977).

Late Archaic

As a technological and cultural entity, the Late Archaic substage from ca. 4500-3000 B.P. exhibits a remarkably consistent set of artifactual remains, settlement patterns and subsistence strategies over much of eastern North America, and particularly along the

Atlantic seaboard. Archeologists have long recognized the uniformity of Late Archaic assemblages and adaptive strategies, and have grouped sites under such terms as the "Stallings Island Culture" (Stoltman 1972), "Transitional Period" (Witthoft 1953) or "Savannah River Complex" (Coe 1964). Despite the potential dangers of geographically restrictive identifiers, those schemes merely serve to label a widespread phenomenon which might be better described as a horizon, in the same sense that Early Archaic horizons are recognizable within limited temporal spans and large geographic ranges (Turnbaugh 1975; Tuck 1974).

The Late Archaic is among the most intensively studied, yet consistently problematic of all aboriginal periods since it involved both termination of the Archaic stage of generalized hunting and gathering *and* the adoptive, gradual transition to ceramics and food production (horticulture) and preoccupation with burial ceremonialism that marks the Woodland stage (Griffin 1967).

Late Archaic sites in riverine or estuarine settings often consist of concentrations of fire-cracked rocks, mussel shells and organically stained midden soils. In combination with certain distinctive artifacts and generally larger size than earlier Archaic stage sites, those factors contribute to a high degree of archeological "visibility." Sites occupying alluvial bottomlands and terraces also are frequently exposed by modern farming techniques. Piedmont sites generally lack organic middens, but the presence of distinctive large, square-stemmed Savannah River points (Claflin 1931; Coe 1964) serves to identify them.

General archeological consensus (Griffin 1967; Dragoo 1976; Kinsey 1972; Custer 1978) is that large Late Archaic sites with midden deposits and dense artifact concentrations are the product of seasonally concentrated populations which had achieved at least partial sedentariness by successful attainment of Caldwell's (1958) "primary forest efficiency." By Late Archaic times, it is argued, prehistoric subsistence patterns were attuned to ecologically diverse environments yielding seasonally abundant and highly predictable resources, especially shellfish, anadromous fish species, nuts and game animals. The entire pattern, of course, had developed gradually over some 6000 years, but culminated in the Late Archaic with stabilization of sea levels and temperature gradients conducive to fish migrations and establishment of potential inland estuarine shellfishing areas (Turnbaugh 1975; Cook 1976; Custer 1978; Gardner 1978).

Dragoo (1976) discusses the Late Archaic in terms of a "Coastal (Piedmont) Archaic", focusing on the coastal/estuarine development and adaptations of the "Broadspear Tradition" (Kinsey 1972) in the northeast. Series of radiocarbon dates from culturally and naturally stratified sites like Stallings Island (GA), Lake Spring (GA), Doerschuk (NC) and others indicate, however, that the Broadspear or Savannah River tradition/horizon had its inception and fullest development in the Southeast along major rivers like the Savannah and Pee Dee (Claflin 1931; Miller 1949; Bullen and Greene 1970; Stoltman 1972; Coe 1964). Similar artifact forms, settlement patterns and subsistence strategies also characterize Late Archaic sites along the interior riverine systems of the midsouth (Lewis and Lewis 1961; Lewis and Kneberg 1959; Webb 1938, 1939, 1974; Webb and DeJarnette 1942).

Several recent analyses of the Late Archaic substage have explored the cultural-ecological nature of its development along the Atlantic seaboard. Turnbaugh (1975) has attempted to define a "Broadpoint Culture" on the basis of maritime adaptations (fishing, shellfish gathering) and a material complex of "broadpoints", steatite cooking vessels, grooved axes, netsinkers and "winged" atlatl weights. The development and spread of this "culture" up the Atlantic Coast is attributed to group migrations in response to northward extension of anadromous fish runs.

Turnbaugh's central thesis has been effectively criticized by Cook (1976), who subjected the evidence to "dimensional analysis." Cook has demonstrated that the technological, stylistic, adaptational and other dimensions of "Broadpoint Culture" were by no means exclusive elements of that culture, but were general Late Archaic occurrences. Nor do radiocarbon dates, population estimates or general anthropological theory support Turnbaugh's argument for physical migrations of people or artifacts. Instead, Cook sees the "broadpoint" as a particular tool form, useful as a horizon marker and functional within the Late Archaic "maritime economies" of the Atlantic seaboard.

Both Turnbaugh and Cook ignore the distribution of broadpoints (Savannah River points) and other trappings of the horizon throughout the southeast in physiographic settings that preclude their utilization for activities even remotely connected with anadromous fish runs. In the Southeast, Savannah River or Stallings Island culture (Stoltman 1974; Coe 1964) is basically defined as a riverine, shellfish-oriented adaptation, and it is from riparian sites that the full complement of Savannah River points, steatite bowls and netsinkers, engraved bone pins, grooved axes and atlatl weights are recovered. However, nearly every survey of Piedmont and Coastal Plain interriverine zones and even the Appalachian Summit region produces evidence for at least limited utilization by Late Archaic groups, without the full array of Stallings or Savannah River material culture (House and Ballenger 1976; Goodyear 1978; Taylor and Smith 1978; Keel 1976). Savannah River points from mixed Archaic upland contexts or as isolated finds are probably attributable to hunting-related activities (House and Wogaman 1978), rather than fishing or shellfish-gathering. Savannah River points as a widespread phenomenon obviously served a more generalized functional role than if viewed solely from the contexts of shell midden sites.

Late Archaic sites in the Southeast are also notable for producing the earliest evidence of ceramics in North America, dating to at least 4400 B.P. (Stoltman 1974). Increased sedentariness, permitted by stable food resources, in combination with presumed population increases are seen as important attributes of the Late Archaic substage. The introduction, or innovation of ceramic vessel manufacture within that context appears to be part of a logical(?) continuum of storage/ cooking technology following steatite vessels and, in some areas, steatite-tempered pottery (Griffin 1967; Caldwell 1958, Stephenson and Ferguson 1963; Stoltman 1972).

A major argument exists over whether fiber-tempered ceramics were indigenous inventions or the product of cultural contact situations, which for the present, remains a moot

question (Stoltman 1974; Ford 1966). Thick, fiber-tempered ceramics found at sites such as Bilbo, Rabbit Mound, Stallings Island and Lake Spring on the Savannah River *do* initiate the production of ceramic storage or cooking vessels in what are otherwise identifiable Archaic stage contexts, pointedly emphasizing the transitional nature of the Late Archaic to the Woodland stage (Griffin 1967). Within the Late Archaic levels at those sites, divisions such as Stoltman's (1974) Stallings I and II are made basically on the presence or absence of ceramics, although there is evidence that intensity of shellfish exploitation and/or sedentation may have increased simultaneously. Interestingly, Goodyear (et al. 1979) notes that Coe's (1964) Savannah River complex is by definition nonceramic, but that a slight change in associated point morphology to what has been termed Otarre stemmed points (Keel 1976) may be evidenced from the Stallings I/Stallings II division.

The exact nature of the Late Archaic to Early Woodland transition in the greater Southeast, and especially the Piedmont remains very unclear, even so far as material culture is concerned. Coe's investigation at the Doerschuk, Lowder's Ferry and Gaston sites revealed physical separation by sterile flood deposits between aceramic Savannah River and ceramic period Vincent and Badin complexes, with no hint of transitions. Recent work elsewhere in the Carolinas has revealed at least partial evidence of a transition, as in the case of Otarre points from the Appalachian Summit region, but firmly established stratigraphic successions of complete assemblages are lacking (Keel 1976; Anderson et al. 1979).

A final element of the Late Archaic substage that deserves mention is the genesis of plant domestication. Intensive harvesting of wild plant foods had its inception well back into the Archaic stage, although attentions seem to have concentrated on nuts (hickory, walnut, acorn), that are both easy to gather and provide high levels of carbohydrates, protein and fat (Asch et al. 1972). By at least 4000 B.P. there is evidence that selective harvesting of nonmast seeds (grasses, sunflowers, marshelder, sumpweed, and chenopodium) had progressed to the point that incipient, if not actual plant husbandry is recognizable in the archeological record. Early cultigens have been identified at sites in the Midwest riverine region, especially the Ohio River drainage, where preservation in dry caves, through carbonization, or in shell middens facilitates recovery of plant remains. Analysis of paleobotanical data and associated radiocarbon dates by Yarnell (1976), Streuver and Vickery (1973), Chomko and Crawford (1978) and others indicates that indigenous cultigens (sunflower, sumpweed) and introduced species (squash, gourds) were part of Late Archaic diets in the Midwest by 2500-2000 B.C.

Horticulture is generally regarded another part of the transition to the Woodland stage (Griffin 1967; Dragoo 1976; Stoltman 1978), in combination with ceramics and increased ceremonialism as manifested in mound burials. Paleobotanical studies have demonstrated an earlier Late Archaic beginning for plant husbandry, which clouds the issue; the earliest Stallings variety ceramics, however, are evidently not found in association with cultivated plant remains, so the entire set of Woodland definiens remained incomplete in the Savannah River region at those early dates. Published data are lacking, but opinions are that plant husbandry was not introduced into the Savannah River region until ca. A.D. 800 and did

not become an important dietary element until some time afterwards (Stoltman 1974). Coe (1964) takes an even more conservative stance, placing the date at ca. A.D. 1000. The important Mesoamerican panoply of beans and squash by all accounts did not become a subsistence focus until well into the Woodland or even Mississippian stage along the Atlantic seaboard (Yarnell 1976).

In summary, the Late Archaic in the North Carolina Piedmont is identifiable on the basis of Savannah River points and occasional associations of steatite vessel fragments, bipinnate atlatl weights, grooved axes, and minor shell midden deposits (Coe 1964). The elements of massive shell deposits, plant husbandry, and an artistic bone/ antler industry found elsewhere along the Atlantic slope are missing, although they may be present in attenuated form within the South Coastal portion of the state (South 1976; Phelps 1980).

Woodland Stage

Archeologists have persistently used the designation Woodland to describe an adaptational stage, developed out of the Late Archaic, that combined burial mounds, ceramics and the use of cultigens (Griffin 1946, 1967). Exactly when those three items were simultaneously present among any one group is a matter of debate, surpassed in intensity only by attempts to define their separate appearances. Ceramics and at least some cultigens had their first appearances in the Southeast and Midwest by 4000 years ago (Stoltman 1974; Yarnell 1976). It is very doubtful, however, that their presence had much effect on the subsistence or settlement patterns of groups possessing them; it has even been suggested that a certain conscious resistance to their acceptance may have existed (Caldwell 1958).

General consensus among archeologists for the beginnings of the Woodland stage in the South Atlantic Slope region hinges mainly on the presence of typologically Early Woodland pottery, i.e., fabric-impressed, cord-marked or check-stamped wares tempered with sand or grit, rather than fiber-tempered Late Archaic varieties (Griffin 1978). Dates for the appearance of Woodland pottery in the Southern Piedmont tend to cluster around 2500 years B.P. (Goodyear et al. 1979:Figure 13). Varieties showing origins in the Coastal or Savannah River Late Archaic are present in the Coastal Plain of North and South Carolina, but appear to have exerted few influences on the development of ceramics in the Piedmont until much later in the Woodland stage (Coe 1964; Milanich 1971; Phelps 1980; Loftfield 1976).

Information on burial mounds is largely lacking for the Southeast for this time period (1000-600 B.C.), perhaps reflecting an earlier nonparticipation by Archaic groups in the trade networks (copper, shell, etc.) noted by Caldwell (1958) and identified by Winters (1974) and others as a precedent for Early and Middle Woodland burial "cults". Very few data on early cultigens have been recovered in the Southeast, as previously mentioned, so their importance for "influencing" the Woodland transition cannot be measured.

As with any long span of archeological development, the Woodland stage is commonly divided into smaller temporal or functional units for discussion purposes, i.e., Early, Middle and Late Woodland. Following the lead of Griffin (1946, 1967) and Dragoo (1976), the first two of those taxonomic divisions conform roughly with the Midwestern cultural florescences of Adena (Early) and Hopewell (Middle), neither of which apparently affected the Carolina Piedmont Woodland groups of the same age, either in ceramic types or burial practices (Coe 1964; Ward 1980).

Late Woodland has been used as a catch-all descriptor for groups who either followed the Hopewell florescence or simply did not participate (Griffin 1967) and are thus said to represent a decline of some sort. The ambiguous nature of that period or substage designator has been severely criticized (Stoltman 1978; Brose 1978), but, like the earlier defined substages holds little meaning for the Carolinas.

The relative temporal terms Early, Middle and Late Woodland are used in Piedmont archeological literature, but are equated with the local sequences isolated by Coe (1952, 1964), based mainly on seriated ceramic and projectile points forms rather than burial practices or subsistence orientations. The following discussion therefore uses the same arbitrary terms Early, Middle and Late Woodland without implying any connections with the connotations implicit in literature from the larger area of eastern North America.

Early Woodland

J. R. Caldwell, in his 1958 synthesis of southeastern prehistory, identified a hiatus between Late Archaic and Early Woodland occupations of the Georgia and Carolina Piedmont (1958:22). Caldwell proposed a migration of the Kellogg Focus people out of eastern Tennessee to explain the abrupt appearance of the Middle Eastern Tradition fabric-marked ceramics in the region. Middle Eastern ceramics, including Baumer, Dunlap and Badin varieties were identified by Caldwell as the earliest Woodland varieties, whose eventual distribution coincided with the limits of the eastern deciduous forest. According to Caldwell's hypothesis, Kellogg Focus groups were aided in their expansion to the Fall Line by an adaptive pattern somehow more efficient than that of the Late Archaic shell mound types they displaced. Kellogg successes were based on intensive harvesting of acorns and improved technology in the form of storage facilities (pits for acorns) and perhaps the bow and arrow (Caldwell 1958:25-27).

A similar abrupt termination for the Late Archaic is inferred for the North Carolina Piedmont by Coe (1964:123), who argues that:

in the central Piedmont, however, it (the Savannah River phase) did not develop gradually into an early ceramic period as was true to the north and south.

while also recognizing (1964:124) that:

perhaps this period of transition simply did not exist at the sites that have been studied and will be found when further explorations are completed in this area.

His qualified opinion was, of course, based on excavated data from the Doerschuk, Lowders Ferry and Gaston sites, where Late Archaic stratigraphic levels were physically separated by sterile alluvial sands from the earliest ceramic-bearing layers, which also produced radically different types of projectile points. This physical separation is labelled "Cultural Discontinuity" on a chart accompanying his report for those sites (Coe 1964: Figure 116).

Following this lead, then, it would seem that Caldwell's ideas of physical migrations (of artifact assemblages, if not actually bodies) could be given credence. From the Uwharrie and Roanoke areas, Badin Series and Vincent Series ceramics, respectively, constitute the earliest manifestations of the new Woodland stage storage/cooking technology, while Savannah River points are replaced by large, crude, triangular Yadkin or Roanoke points. Badin and Vincent ceramic wares included are well-made sand-tempered, fabric-impressed and cord-marked vessels. Dates for their appearance are given as ca. 2000 B.P. (Badin) and 1050 B.P. (Vincent) (Coe 1964:55, 119).

Caldwell's model receives additional (unintentional?) support from Coe's statement that, based on the well-developed nature of Badin types, the "techniques of pottery making were well-developed before their introduction to the Piedmont" (1964:27). With this type of negative evidence as support for discerning the Early Woodland transition in the Piedmont, it follows that sites elsewhere might contain pertinent information, specifically in the Coastal Plain and Mountain regions.

Phelps (1975, 1980), South (1976), Loftfield (1976) and other investigators of North Carolina Coastal Plain prehistory recognize a transition from fiber- and steatite-tempered pottery traditions of the Late Archaic into the Early Woodland sand-tempered, cord-marked wares. Phelps' Deep Creek phase marks the successor to earlier forms, in association with small stemmed point forms that, he says, are transitional from Savannah River types (Phelps 1975, 1980). Loftfield's New River phase is equated temporally with Thom's Creek and Deptford phases (ca. 3000-2500 B.P.) further south in South Carolina and Georgia (1976). Anderson (1975) also traces this extension of Caldwell's "Northern Tradition" (1958) ceramics as far south along the coast as the Savannah River by around 3000 B.P.

Artifactual evidence of an Early Woodland substage in the Appalachian or Blue Ridge mountain region has been recently summarized by Keel (1976) and Purrington (1980). The Swannanoa phase was identified by Keel at the Warren Wilson site, separated stratigraphically from a Savannah River component and dated to ca. 2600 B.P. Ceramics are typically cord-marked or fabric-impressed and are tempered with either sand or crushed quartz in equal frequencies. Swannanoa phase ceramics are comparable to types from eastern

Tennessee and northern Georgia (Caldwell's Kellogg focus), although Keel feels that Caldwell's Northern Tradition is represented here, rather than the earlier Middle Eastern Tradition (Keel 1976:230).

Other elements of Swannanoa material culture do not vary significantly from the preceding Savannah River component at Warren Wilson, including stemmed points, bar gorgets, net weights and the continued use of steatite vessels. Relative size of hafted bifaces decreases, but a morphological continuum from Savannah River through Otarre to Swannanoa Stemmed seems feasible; no abrupt displacement by triangular forms is indicated in connection with the introduction of ceramics (Keel 1976:194-198, 230-231).

Purrington's recent (1980) overview of the Appalachian Summit region follows Keel's lead in recognizing Swannanoa ceramics as an introduction which had little effect on basic patterns of material culture. No evidence for horticulture has been noted by Purrington, but he has recognized, at least tentatively, a settlement shift in the Early Woodland away from the river valleys to more dispersed patterns. No causal arguments are tendered, but Purrington sees this as a reversion from Late Archaic sedentariness to the more mobile, diversified patterns of the Middle Archaic substage, including reoccupation of rockshelter sites by Swannanoa phase peoples.

Early Woodland settlement in the Coastal Plain thus seems to be a development from Late Archaic patterns, if ceramic distributions and taxonomic studies are true reflections of cultural developments (South 1976; Phelps 1976, 1980). Sites in the Appalachian Mountains, on the other hand, seem to evidence an introduction of ceramics from outside the area, much as postulated by Caldwell (1958) and Coe (1964) for the Piedmont. No discernible changes in material culture other than the addition of ceramics are seen however (Keel 1976; Purrington 1980), in contrast to the Piedmont situation. Archeologists in both the Coastal Plain and Appalachians equate the Early Woodland ceramic introduction with Caldwell's (1958) Northern Tradition, however, ignoring the precedence he placed on a so-called Middle Eastern Tradition of fabric-impressed wares. This is possibly attributable to an inability to establish stratigraphically separate identities for fabric or cord decorated wares, hence divisions like Swannanoa Fabric-Impressed/Swannanoa Cord-Marked and Badin Fabric-Impressed/Badin Cord-Marked (Keel 1976; Coe 1964).

Middle Woodland

Definition of a Middle Woodland substage in the Carolina Piedmont is currently a ceramic typology construct, based on development or introductions of new decorative techniques or technological features. Outside the Appalachian Summit area few if any connections with the Hopewell "interaction sphere" of trade and burial ceremonialism are observable (Keel 1976; Coe 1964; Ward 1980). However, Woodland stage burial mounds have been identified from the Southern Coastal Plain (Mathis 1979). Phase names are applied to Middle Woodland ceramic sequences in the Coastal Plain (Mount Pleasant, Cape Fear, Middle Period) and Mountains (Pigeon, Connestee) (Phelps 1980; South 1976; Haag

1958; Purrington 1980; Keel 1976). In the Piedmont, Coe's Yadkin (Uwharrie area) and Vincent (Roanoke Basin) series are temporally coeval with an Eastern Middle Woodland period (Stoltman's Late Developmental Neolndian period [1978]), although the evident lack of interregional trade and burial ceremonialism cannot be overemphasized. As a technological or cultural substage, a Piedmont Middle Woodland may not exist; at best, it exists as a stylistic construct, as currently understood.

Coe's Yadkin series pottery continues traits of cord-marking and fabric-impressing for the southern North Carolina Piedmont, although crushed quartz replaced sand as a tempering agent. Yadkin ceramics represent an "obvious continuation" of Badin series traits, although during this period certain elements of a more southerly origin (check-stamping, clay-tempering) also made an appearance. In the Roanoke area, Clements or Roanoke series succeed the earliest Vincent types at a much later date of ca. 700 B.P.; there are few changes in surface decoration techniques and none in tempering material and Coe (1964:103) admits difficulty in separating individual sherds into mutually exclusive categories.

General stratigraphic and morphological trends in other cultural elements are present during the Middle Woodland "period", especially projectile points, which show a general decrease in size, coincidental perhaps with the introduction of the bow and arrow by at least 1000 B.P. (Coe 1964:119).

The Northern Tradition of Caldwell (1958:28-31) can be equated, at least temporally, with Middle Woodland. It included the elements of cord-marked, grit-tempered pottery which supposedly displaced the earlier Middle Eastern Tradition throughout the deciduous forest. Manifestations include "cultures" like Copena and Yadkin. While this change has been recognized in the mountains and along the coast (Keel 1976; Phelps 1980), researchers have been less sanguine than Caldwell about postulating actual population migrations.

Late Woodland

The Late Woodland substage in eastern North America is usually viewed as a period of cultural deflorescence intervening between the Hopewell and Mississippian "climaxes" (Griffin 1967). An ample volume of literature treats the decline of the former and emergence of the latter (see Willey 1966 and Stoltman 1978 for references), but little published information concerns the Late Woodland successors to the Hopewell system of widespread trade, burial ceremonialism, social stratification and monumental earth constructions. Stoltman (1978:721-723) prefers to discuss a temporal period rather than a formal substage for the years 1500-1000 B.P., in recognition of the local variability in Eastern culture traditions. Any "decline" during that temporal span is most evident in areas where Hopewell influences or contacts were most direct, as in the Ohio, Illinois, and lower Mississippi valleys. Stoltman, Griffin (1967:189) and others agree that many regions isolated from the interior river valleys were little affected by the Hopewell "interaction sphere" (Struever and Houart 1972), for example:

many regions saw a continuation of cultural patterns established in Late Developmental (Early Woodland substage) times. Thus, large areas along the margins of the East, which were beyond the limits of direct contact with Ohio and Illinois Hopewell and Marksville cultures, were characterized by the persistence into Intermediate times, of local, typologically Middle Woodland cultures that experienced no notable decline. (Stoltman 1978: 722).

This included the Badin-Yadkin sequence of the Carolina Piedmont, as noted by Coe (1964).

Very tangible Hopewell connections, in the forms of imported Ohio ceramics and lithics, have been discovered in east Tennessee and the mountains of North Carolina (Keel 1976; Chapman 1973). A subsequent cultural decline is hard to demonstrate for even those regions as a direct result of the Hopewell "collapse". Successive Late Woodland or early Mississippian phases (Hamilton and Hiwassee Island in Tennessee, Pisgah in North Carolina) instead show reorientations in ceramic styles and basic cultural-technological elements toward the emerging South Appalachian Mississippian tradition (Ferguson 1971).

Ceramic patterns from North Carolina Piedmont sites apparently remained divorced from even that tendency until the early historic period (Coe 1952, 1964). The Uwharrie complex in the Southern Piedmont saw a change to net-impressing sometime around 600 B.P. and some elements of a more southern origin (check-stamping and clay tempering) were noted for the earlier Yadkin Series (Coe 1964:30, 32, 121). No major redirections of ceramics, stylistic or technological, occurred in the southern or northern Piedmont of North Carolina until at least 400 B.P., however. Ceramic series identified by Coe (1952, 1964) and Evans (1955) demonstrate a continuing link with Caldwell's Northern Tradition, rather than the contemporary South Appalachian technique of complicated stamping (Caldwell 1958; Ferguson 1971).

Current knowledge from the entire North Carolina Piedmont (Coe 1964; Newkirk 1978; Barnette 1978; Ward 1980; Woodall 1976) indicates that a generalized Woodland subsistence pattern of hunting and gathering characterized the region until very late prehistoric times. Some small evidence exists for maize agriculture during the Late Woodland (one maize cob from 31Dv4 and corncob impressed pottery from several sites), but most arguments for settled village life supported by intensive food production are based on indirect evidence, i.e., larger sites, hypothetical population increases and evidence for permanent structures (Mathis 1979; Wilson 1976). Two recent studies which deal directly with the problem of Late Woodland subsistence conclude that neither botanical remains nor settlement patterns provide evidence for a reliance on maize horticulture (Newkirk 1978; Barnette 1978).

Late Prehistoric — Early Historic

The final prehistoric cultural manifestations in southeastern North America were heavily influenced by the development of the South Appalachian Mississippian tradition (Griffin 1952, 1967; Caldwell 1958; Ferguson 1971). Although no particular sites or even regions can be identified as the ultimate source (Stoltman 1978:726), archeologists can discern the development 1100-1200 years ago of a distinctive cultural tradition, supported by intensive maize horticulture and efficient hunting and gathering techniques, that involved population growth, territorial expansion, rigid political and social hierarchies, and construction of planned communities centering on temple mound/plaza ceremonial centers.

Although many regionalized subpatterns developed, the larger Mississippian tradition probably had its inception in the central Mississippi River valley, hence the name, sometime around A.D. 700. Many cultural elements were subsequently introduced to indigenous bases elsewhere through population migrations or stimulus diffusion. The fringes of Mississippian culture thus retained many native elements in ceramic styles, settlement patterns or subsistence strategies that demarcate their separate origins, as along the Coastal areas of Georgia, South Carolina and Florida (Stoltman 1978). Examples of Mississippian religious and political centers in the Southeast include Moundville (AL), Etowah, Hollywood and Irene (GA), Rembert and Mulberry (SC) and Town Creek (NC).

Large Mississippian towns were supported logistically by networks of smaller villages and farm hamlets, whose inhabitants were tied socially and politically to the larger units. The major centers constitute the most conspicuous manifestations of prehistoric culture in eastern North America, combining various elements of truncated or conical mounds, plazas, ditches, embankments and palisade lines.

Central to Mississippian culture was a naturalistic religious-political system concerned with crop production cycles, interregional communications, and, in the later stages, indigenous warfare (Griffin 1945). Veneration of the dead through elaborate ceremonies was one of the more typically religious practices as well. Material underpinnings for the complex social system include temple mounds, centralized, often fortified village arrangements, lavish burials of high status individuals ("priest-chiefs"), widespread exchange of scarce raw materials (lithics, shell, copper, etc.) and common decorative elements on pottery, wooden, metal and shell objects. Common denominators of the Mississippian tradition that included social organization, religion and material culture were exemplified in the so-called Southern Cult (Waring and Holder 1945; Brown 1976).

Many of the significant elements of Mississippian tradition ultimately may have had Mesoamerican origins, transmitted piecemeal to the Southeast through undefined cultural channels (Caldwell 1958; Griffin 1945, 1946, 1967). The horticultural subsistence base of maize, beans and squash that supported Mississippian populations was definitely transmitted from Mesoamerica but, as we have seen, at earlier dates than their eventual combination

might suggest (Caldwell 1971). Conclusive evidence exists for an agricultural orientation by 900 B.P. or so, in the form of preserved maize cobs, beans, and squash seeds, as well as definite farming implements; a very major portion of the Mississippian economy in all regions, however, continued to involve intensive gathering and hunting (Smith 1975).

Mississippian stage ceramic forms multiplied both in number and complexity as a direct result of the technological innovation of using burned and crushed shell as a tempering agent (Million 1975, 1977). Again, however, regional variances were in order and sand or grit tempering continued to serve that role in areas outside the main developmental centers. A plethora of new ceramic forms reflect the ceremonialism inherent in Mississippian culture and are often found in graves or other non-utilitarian circumstances. Common decorative techniques included engraving, incising, painting, complicated stamping, and application of nodes, fillets and other appendages (Phillips 1970; Reid 1967; Sears 1952). Vessels often had zoomorphic or anthromorphic shapes or attachments, providing another medium of expression for the designs portrayed on other items made of wood, shell, copper or stone; all may have had totemic or moiety symbolism (Swanton 1946).

Mississippian stage sites, for the first time, clearly witness population migrations into new territories. Certain regional manifestations along the Gulf Coast, lower Mississippi valley and the Ohio Valley, continued to show signs of accepting traits or ideas rather than populations, however. The single known example of Southern Appalachian Mississippian culture in Piedmont North Carolina involves the Town Creek mound complex and associated sites along the Little River in Montgomery County (Coe 1952). The Pee Dee focus or culture has been interpreted as the remains of a group of Muskogean speakers who invaded the area from somewhere to the south around 500 B.P. (Coe 1952:308-309). Cultural elements were stereotypically Southern Appalachian Mississippian, as defined by Ferguson (1971), including elaborate ceramics, a temple mound and associated charnel house, a nucleated, fortified village plan, agriculture, and elaborate shell and copper ornaments.

Despite a technologically "superior" culture, the Pee Dee focus was short-lived and was eventually forced to retreat southward, possibly in response to pressures from historic Siouan tribes from the north, as manifest in Coe's Caraway, Hillsboro, Dan River and Clarksville foci (Coe 1952:308 and Figure 164).

Town Creek and the Pee Dee focus existed for perhaps 200 years as a perfect example of what Clay has called a "strategic" response to a perceived environment (1976). The compact, palisaded central village and apparently limited impact on surrounding Late Woodland stage groups signify that the Pee Dee invasion marked a frontier situation, which eventually failed in light of external pressures (Coe 1952) or, perhaps, internal instabilities caused by warfare, environmental constraints on the agricultural subsistence base (Ferguson 1971:252), or even diseases that characterized the protohistoric period (Griffin 1952).

Preceding descriptions of Southern Appalachian Mississippian culture, while they concern the larger Southeastern pattern, do not accurately treat conditions in most of the North Carolina Piedmont during the same time period. As most researchers have noted (Coe 1952, 1964; Ward 1980; Griffin 1945; Woodall and Claggett 1974; Barnette 1978; Newkirk 1978) the majority of late prehistoric or early historic aboriginal populations of the last 400-500 years persisted in an essentially Late Woodland adaptive stage.

A major focus of Piedmont research has been the identification and excavation of historically-recorded Indian sites, analysis of the associated material culture and search for archeologically defined antecedents (Coe 1937, 1949, 1952; Coe and Lewis 1952; Griffin 1945; Speck 1935; Lewis 1951; Autry 1975). Linguistic and ethnohistoric records allow identification of four major language stocks within the boundaries of North Carolina at the time of initial European contacts (Swanton 1946; Speck 1935; Griffin 1945).

Along the coast and extending north into Virginia were groups of Algonkian-speakers which included some of the "tribes" first encountered by English settlers in the region. Identifiable groups include Powhatan, Weanock, Nansemond, Weapemeoc, Roanoke, Secotan and Neusiok (Binford 1964; Feest 1978a, 1978b). Those groups lived in sedentary villages, at least until disrupted by post-contact pressures, supported by limited horticulture and a gathering-hunting base strongly oriented toward exploitation of anadromous fish resources common in the coastal estuarine zone (Binford 1964).

Inland, on the inner Coastal Plain and along the Fall zone of the Roanoke, Tar and Neuse Rivers were the Iroquoian-speaking Tuscarora. Those "warlike" people were involved in most regional Indian-white conflicts of the early historic period (Lawson 1967; Boyce 1978:287). Tribal organization among the Tuscarora was structured around local leaders, who exerted social control through the mechanism of acquired status. Settlements were scattered, rather than nucleated in villages, in partial reflection of an economy dependent on game found in the Tuscarora "hunting quarters" to which entire communities would move during the appropriate season (Boyce 1978; Binford 1964; Lawson 1967).

The North Carolina Piedmont is generally acknowledged to have been occupied by several tribes of Siouan-speakers during the late prehistoric and early historic periods, for which a considerable body of archeological and ethnological data exists (Coe 1937, 1949, 1952, 1964; Speck 1935; Griffin 1945; Lewis 1951; Lawson 1967; Mooney 1894; Swanton 1936; Autry 1975). Excavations of several late prehistoric and early historic Siouan sites have been conducted by the Archeological Society of North Carolina and the Research Laboratories of Anthropology at Chapel Hill during the last several decades. Information on those works has been summarily discussed by Coe (1952, 1964) and others, although much of the information remains unpublished.

Late prehistoric Indian remains that may be attributable to Siouan occupations include the Uwharrie complex, in the southern Piedmont and the Clements and Roanoke complexes of the Roanoke area (Coe 1964; Evans 1955). Those "cultures" have been identified arche-

ologically on the basis of ceramic types and associated artifacts which evidence a persistence of Woodland stage material culture and economies. Net-impressed pottery is typical of the southern Piedmont tradition, while cord-marking and fabric-impressing remained common along the North Carolina/ Virginia border (Coe 1952; Coe and Lewis 1952).

Displacement of southern Uwharrie groups by the Mississippian Pee Dee people took place around 500 B.P. (Coe in Ferguson 1971:116). The Siouan "hill tribesmen" who retreated northward in the face of that advance are visible archeologically in the Dan River focus. Ethnoarcheological studies have identified the Sara Indians as historical possessors of that material culture, which continued the Uwharrie tradition of net-impressed ceramics, although more elaborate vessel rim and neck decorations were present, as well as scraping of vessel interiors (Coe 1952:309-310; Coe and Lewis 1952). Excavated sites which have produced materials of the Dan River focus include the Upper and Lower Sauratown, and Saponi, on the Dan and Yadkin Rivers (Coe and Lewis 1952; Griffin 1945; Swanton 1946, Autry 1975).

After the Pee Dee "retreat" around A.D. 1650, the southern Piedmont was characterized by the Caraway complex which combined ceramic and other cultural elements of both the Siouan and southern Appalachian Lamar traditions (Coe 1964:124).

A less dramatic cultural "discontinuity" is visible for the northeast North Carolina Piedmont coeval with the early historic period. The Hillsboro focus was identified at the Occaneechi village site in Orange County, dating to around 250 years B.P. (Griffin 1945: 325; Coe 1952:310). Characteristic ceramics are stamped with carved wooden paddles, producing simple stamped or check stamped designs which mark a significant stylistic change from earlier cord-marked or fabric-impressed wares of the Clarksville series (Coe 1952; Evans 1955; Miller 1962). An analogous shift to stamped ceramics was found at the Gaston site at around the same time period, as the Gaston series replaced the more typically Woodland Clements series (Coe 1964:105). Other prominent ceramic decorative techniques included folded or thickened rims, corn cob-impressing and incising or other decoration of vessel rims and necks (Coe 1964; Coe and Lewis 1952).

Sites of the Dan River, Caraway, Hillsboro and other Late Woodland foci are also characterized by village plans emphasizing nucleation defense, i.e., stockades (Coe 1952, 1964). This may reflect external pressures from groups like the Pee Dee culture, or perhaps more internalized competition with other Siouan-speaking groups for limited sets of vital resources (cf. Clay 1976).

Additional elements of early historic period material culture included changes in smoking pipe forms from Woodland monitor or platform types to L-shaped or alate-stemmed varieties, often decorated with incised geometric designs (Coe 1952:311, 1964: 115). Trade goods in the form of glass beads, gunflints, iron axes, copper hawk bells or white clay trade pipes have been recovered from several Siouan sites of the late seventeenth and early eighteenth century, including Keyauwee, Occaneechi, and Enotown. Those items

serve to date some portions of the sites' occupancies while also acting as a measure of contacts with white traders and possibly, proximity to the historic Trading Path (Lawson 1967; Autry 1975; Rights 1957).

Early studies of Carolina Siouan groups employed available linguistic and ethnographic data to trace tribal migrations from an hypothesized homeland in the Ohio Valley (Mooney 1894, Speck 1935; Swanton 1936). Cherokee migrations from the same area into western North Carolina were also critical to that explanatory model. Other Siouan groups in the North Carolina Piedmont and southern Virginia were supposedly displaced from the Coastal Plain by Algonquian tribes some time around 500 B.P. (Griffin 1945; Speck 1935).

Just as recent archeological and ethnoarcheological studies have demonstrated an *in situ* development for the Iroquian-speaking Cherokee (Keel 1976; Dickens 1976), it is also possible to demonstrate autochthonous growth for the Piedmont Siouan tribes without invoking migrations as a source. External pressures during the early historic period eventually led to large scale displacement of indigenous groups within and outside of North Carolina, but, if material culture is an accurate reflection of group identities then reasonable continuities exist for development of Siouan tribes from a general Piedmont Late Woodland base (Griffin 1945:327, 219).

Linguistic studies based on admittedly scanty data have also allowed the division of historic eastern Siouan-speakers into northern, or Tutelo, and southern, or Catawba divisions (Speck 1935; Swanton 1946; Griffin 1945). Groups or tribes of each division were encountered by early explorers of the Carolina-Virginia region during the late sixteenth and early seventeenth centuries (Lawson 1967; Miller 1957) and their village locations were mapped with varying degrees of accuracy (Swanton 1946; Rights 1957; Autry 1975). Further identifications have been made on the basis of archeological data recovered from certain of those sites, which include both aboriginal and Euro-American items (see above discussion). Ideally, it should be possible to accurately distinguish member sites of the larger linguistic divisions --Tutelo or Catawba -- from patterns of material culture, i.e., ceramic styles, pipe forms, trade goods, etc. Excavation and reporting of historically identifiable sites in combination with recognition of broad patterns like the relative differences in Dan River and Hillsboro ceramic series may eventually make that possible.

PREVIOUS ARCHEOLOGICAL INVESTIGATIONS

A considerable body of data has accumulated over the last 15 years concerning prehistoric and historic cultural resources within the B. Everett Jordan (formerly New Hope) Reservoir project area. Investigations by archeologists affiliated with two private consulting firms, the University of North Carolina and the Army Corps of Engineers, have produced at least minimal data on over 350 sites or structures. Findings of the various survey and excavation programs reflect an assortment of implicit or explicit goals which mirror the gradual development of cultural resource management and archeology as interrelated disciplines.

This report section will summarize the techniques and results of previous archeological projects and will serve to provide some comparative methodological and interpretive perspectives for the recent excavations at 31Ch8 and 31Ch29.

Initial archeological survey of the reservoir was undertaken in 1964 by personnel from the Research Laboratories of Anthropology at UNC-Chapel Hill, under the guidance of Dr. Joffre Coe (Smith 1965a). In keeping with the state of Piedmont archeology and nascent goals of cultural resource management in the early 1960s, the resultant report, later revised as a Master's thesis (Smith 1965b) was structured around two objectives.

The first, strictly logistical objective was to locate as many archeological sites as possible within constraints of available time and money. Pedestrian survey was confined to cultivated fields and other areas clear of vegetation, with no attempts made to examine forested tracts characteristic of much of the project area. It was felt that this admittedly biased sample would somehow skew the resultant data toward an overrepresentation of Archaic stage sites, to the detriment of later remains (Smith 1965b:1).

Identification of cultural "complexes" represented by surface-collected artifacts from the various sites was the second explicit objective of the 1964 survey. Corollary interpretations included the discernment of regional patterns of Archaic and Woodland (Developmental) settlement in the Haw and New Hope River Valleys (Smith 1965b:2). Pattern recognition was based on the general scheme of "diagnostic" ceramic types and projectile points constructed by Coe (1952, 1964).

The 1964 survey resulted in the collection of 3000 artifacts from either 175 (Smith 1965a:46) or 176 (Smith 1965b:149) sites. One hundred forty-two new sites and 34 previously recorded sites were examined and analyzed, mainly on the basis of nonsystematic collections of projectile points and ceramics (Smith 1965b:165 ff).

Archeological sites mapped along the lower Haw River portion of the reservoir included 31Ch8, 28, 29, 33, 34, 35 and 145. No sites are recorded for the west side of the river or further upstream than the SR 1941 bridge; presumably no examination was made of those areas. Site 31Ch8 generated considerable excitement as the former locus of a "Woodland mound" which had produced human skeletal remains in association with shell beads and other artifacts during land levelling operations three years previous (Smith 1965a:6-7). The actual presence of a mound is problematic, as is the Woodland stage identification for the burial(s), if they were in fact uncovered four feet (1.2m) below the surface, as Smith was told (1965b:11-12).

Site 31Ch28 was identified as a "dominantly" Late Archaic occupation on an "old natural levee" of the Haw River, in proximity to 31Ch29, which produced a "few potsherds and chips" from a fallow field on the east bank of the New Hope [sic] River (Smith 1965b:17). The "Late Archaic" specimens from Ch28 include single examples of Halifax and Morrow Mountain points, both of which are correctly assignable to the Middle Archaic.

All three sites (31Ch8, 28 and 29) were found on "levees" along the Haw River floodplain; sites 31Ch35, 33 and 145 were defined in the same general area, although their topographic situations varied somewhat. 31Ch35 was mapped on the large island immediately west of the Ch8, 28, 29 site group. No artifacts are listed, but it was "reported" to be a small site exposed during logging operations on the island. Sites 145 and 33 were identified as producing Early and Late Archaic and Woodland materials, respectively, although no diagnostic artifacts are listed for the former site (Smith 1965b:170). Site 145 was defined along an eroded logging road and Ch33 was located in a cultivated field adjacent to the river, where sparse patches of soybeans and tobacco were taken as evidence for "packed house floors" associated with a Woodland stage village (Smith 1965b:18). No surface distributions of artifacts were noted, however, and like most sites identified by this and subsequent UNC surveys, the site boundaries appear to be coterminous with the limits of cultivation. Ceramics and projectile points collected from Ch33 represent a full range of Developmental styles and forms, from Badin through Caraway (Smith 1965b:165-167). Site 31Ch34 was located at the confluence of the Haw and New Hope Rivers and identified as a Woodland occupation, although no collections are listed (Smith 1965b:19, 165, 167).

Interpretations of the 1964 data are minimal in the initial report (Smith 1965a) but were carried out in greater detail in Smith's thesis (1965b). It was felt that Late Archaic substage occupations were the most frequently represented in the survey sample, but that must be regarded with extreme caution, since Smith subsumed all materials now generally regarded as Middle Archaic under that rubric (Smith 1965b:150). A considerable number of sites produced Middle Archaic Stanly, Morrow Mountain, Halifax and Guilford artifacts (Smith 1965b:167 ff), a point correctly noted by subsequent investigators (McCormick 1970, Wilson 1976).

Smith's efforts are useful mainly for their descriptive aspects, despite minor inconsistencies. His interpretations of Archaic stage occupations are low-level, consisting of cataloging typological variability in hafted bifaces (1965b:56-106) with no consideration for other tool forms or even the temporal-geographical implications of his defined types.

Similar analyses were performed by Smith for ceramic collections from the New Hope Reservoir sites, culminating in the definition of the New Hope ceramic series, previously undefined in the Piedmont.

Smith recognized within his collection of 372 sherds several specimens resembling forms named Badin, Clements, Caraway and Uwharrie according to the typologies of Coe (1952a, 1952b, 1964). The majority of his collection (303 specimens, or 81.5 percent) was assigned to the New Hope series, mainly on the basis of prehistoric selection for crushed feldspar rather than the usual sand or crushed quartz as tempering agents. Mixtures of feldspar and quartz, feldspar and sand or all three items seem to be common within his definition, however.

While no additional information is provided on a regional distribution for the "complex", perhaps the most unfortunate consequence of Smith's interpretations is the origin of a very hypothetical cultural construct, engrained in much subsequent research in the reservoir area. In fact, for resource management purposes, his recommendations for further work center on elucidation of the Developmental sequence "problem" through excavations of sites like 31Ch28, 33 and 29 (McCormick 1969, 1970; Wilson 1976), which in turn failed to resolve the situation.

Archeological investigations in the reservoir area during 1969 followed the same direction as previously. McCormick's report (1969), again modified as a Master's thesis (1970), describes the results of additional survey and test excavations at ten sites. Survey was again restricted to cleared ground, which furnished basic information on between 34 and 76 resurveyed sites, depending on which set of figures given by McCormick is more nearly accurate (McCormick 1969:2, 37; 1970:3, 20). The maximum total number of sites mentioned is 340.

McCormick's reports provided only minimal data on newly-discovered sites, exempting such information as condition, location and dimensions. Three sites are mapped in the general vicinity of the Haw River group, including 31Ch159, 164 and 165. The latter two sites are outside (above) the reservoir limits and are cursorily described as producing no diagnostics (164) and Late Archaic-Early Developmental materials (165) (McCormick 1969:11). Site 31Ch159 was found near the Haw-New Hope confluence, above Ch34 and yielded artifactual evidence of Late Paleo-Indian (Hardaway) occupations, as well as Archaic specimens (McCormick 1969:10). That site was later selected for test excavations, principally because of the Paleo-Indian component.

Despite the brevity of his site description and analysis techniques, McCormick attempted to interject some standardization into his reporting efforts by devising an evaluation scheme for project impacts and archeological significance, as follows (McCormick 1969:10-11):

A system was devised for ranking sites on their potential value for any future archeological work. Any one site, when evaluated individually without regard to all the others in the survey, might seem more important than if it were viewed in relationship to every other site. For this reason, and to best exploit the prehistoric resources of the area, the classification system chosen is collective rather than individual.

A-1 Test excavation needed; destruction imminent.

A-2 Test excavation needed; destruction possible.

A-3 Test excavation useful; destruction imminent.

A-4 Test excavation useful; destruction possible.

B-1 Further surface collecting needed; destruction imminent.

B-2 Further surface collecting needed; destruction possible.

B-3 Further surface collecting needed; no danger of imminent destruction.

B-4 Further surface collecting useful; destruction possible.

B-5 Further surface collecting useful; destruction possible.

C No further work recommended.

It must be realized that even a rigorous surface collection, during which any visible cultural materials are recovered, may only reflect a partial sample of all such material actually present. In an effort to minimize this factor, many of the sites were collected on more than one occasion. Even with this precaution, the time frame components assigned each sites are only indicative of the diagnostic artifacts in the surface collections and may or may not be a true representation of the total occupation of any given site.

Several weaknesses are inherent within McCormick's system. First, the majority of terms for either *impacts* or *potential* are weakly or imperfectly defined. Project impacts are implicitly based on site locations relative to reservoir pool elevations; no consideration is made for other construction activities, potential erosion or the fact that inundation does not necessarily result in the "imminent destruction" of archeological materials (Carrell et al. 1976). Perhaps more importantly, McCormick fails to provide rigorous justifications for archeological "potential" or the need for additional collecting, excavation, etc. He hints at the "collective" nature of the resources, but at no point in either the 1969 or 1970 publications does he provide a research design for integrating the data into anything more than very basic chronological or subsistence-settlement models (McCormick 1970:22-26).

McCormick also neglected to include the earlier site data of Smith (1965a and 1965b) into his evaluative scheme, further compromising its effectiveness from a management and evaluative standpoint. Much of McCormick's effort devolved from Smith's earlier objective of assigning temporal identifications to site occupations, based on the frameworks erected by Coe (1952, 1964). Having performed minimal analyses at that level, McCormick proceeded to "select" and test excavate ten sites that he felt had "potential" for containing stratified remains of *all* cultural periods represented in the survey surface collections, presumably extending from the Paleo-Indian through Historic Euro-American stages or periods (1970:28).

Smith (1965b:45) had recommended a total of seven sites for additional testing or extensive excavation, including 31Ch8, 18, 33, 57, 88, 96 and Dh13. In two seasons of fieldwork McCormick's crews investigated only Ch8 and 33, leaving the others unexplored

except perhaps for additional surface collecting. Additional sites chosen by McCormick included 31Ch28, 29, 34, 159, 49, 45, 190 and 231. Some were newly discovered and constituted potentially significant finds (Ch159) or were fortuitously chosen because of circumstances of destruction (28) or geographic proximity (29). The search for buried, stratified remains was a stated goal, of course, but certain of the sites (the Farrar Farm group (1970:40 ff) were excavated despite the fact that they were situated in active meander systems of the New Hope River.

What emerges, then, is a pattern of site selection based on geographical proximity within two areas – the lower Haw River and the New Hope-Beaver Dam Creek confluence (McCormick 1970:Figure 5). Other sites within the reservoir area, totalling somewhere around 330, were excluded from consideration with only the weakest sorts of justification.

Excavations by McCormick's crews proceeded in fairly standard increments of 5' x 5' units, with natural level excavations preferred. Soil was dry-screened through either 1/4" or 1/2" mesh, although the potential biases introduced into the data base were never assessed (McCormick 1969:21).

Site 31Ch8 was tested with three 5' x 5' units, located approximately equidistant along the "point bar alluvial terrace." Depths below surface for each pit were recorded as 7.5' (2.3m), 5.1' (1.6m) and 4' (1.2m) sequentially from south to north. Test 2 was *estimated* (our emphasis) to begin at the terminal depth of No. 1, which would mean that over 3.8m of vertical stratigraphy were exposed. Profile drawings depict alternating series of light and dark brown sand lenses although "no indication of habitation surfaces" was discerned (McCormick 1969:24). A total of 1068 items was recovered from the Ch8 tests, representing Middle Archaic, possibly Late Archaic (?) and Early and Middle Woodland occupations. No features or evidence of a Woodland mound were recognized and despite basic superposition of diagnostic materials, McCormick hypothesized that the site was "obviously" frequently flooded and the artifacts could have been redeposited from (unidentified) nearby areas (McCormick 1970:37).

Middle Archaic (especially Morrow Mt. II points) through Late Woodland artifact types were collected and excavated from Site 31Ch28. A portion of the site was damaged by topsoil removal operations, but one 5' x 5' unit was placed which demonstrated artifacts within a plow zone overlying sterile clay subsoil (McCormick 1969:29). 31Ch29 was likewise tested with a single unit, due to its proximity to Ch8, although it "looked singularly unpromising". Nothing was recovered below the plow zone, where an endscraper, nine chips and two fire-cracked rocks were found. Nevertheless, the site "showed stratification" of some sort. (McCormick 1969:31).

Other excavations were conducted by McCormick in 1968 at 31Ch34, where Early and Middle Archaic tools and Woodland ceramics occurred on the surface. No artifacts were recovered below the plow zone, although several clay lamellae are evident from the profile

drawing of Test 1, similar to those at Ch8 and 29 (this report). Eleven artifacts were found in a shallow plow zone at 31Ch159, none identifiable with the Paleo-Indian or Early-Middle Archaic specimens from surface collections (McCormick 1969:31). Like Ch34 and 28, this situation was interpreted as erosion and destruction of the "hilltop" occupational record, although additional work was recommended for Ch159. No "real occupations" were discerned at sites Ch8, 29 or 34 as well, although McCormick admitted his 1969 excavations may have missed them (1969:38).

McCormick's 1970 thesis includes the 1968 data, additional information from test excavations at Farrar Farm (Ch44, 45, 190 and 231) and Ch33/33a, and analysis of expanded excavations at Ch28 and 29. The Farrar Farm site group was tested with a total of ten 5' x 5' units, six of which were placed within the limits of 31Ch190. Few artifacts were recovered from Ch44, 45 or 190 and profile drawings indicate shallow deposits overlying sterile clay subsoils (McCormick 1970:11). 31Ch190 surface collections contained artifacts typical of Paleo-Indian through Middle Developmental stages. Excavations again yielded little below disturbed plow zones, although up to 1m of sandy soil deposits were present above sterile clays (McCormick 1970:45 and Figure 12).

Site designation 31Ch33a was applied to a field east of the one containing Ch33 along the Haw River. No artifacts were visible on the surface, but a single 5' x 5' test unit was dug to garner stratigraphic information. Artifacts representing Early and Middle Archaic occupations were found in the pit which extended to 3.2' (.98m) below surface. An attempt was made to correlate Ch33a and the situations outlined by Coe (1964:11-13,88) for deeply buried sites elsewhere in the Piedmont, but McCormick's argument is only weakly confirmed by the available data (McCormick 1970:47).

More than 375 square feet were exposed at site Ch33 in 1968 in six formal test squares and several smaller "tests" placed along a "sand levee" adjacent to the Haw River. Excavations in several of the "house patterns" noted by Smith (1965b) revealed the crop patterns to be caused by dry soil conditions rather than "packed floors" (McCormick 1970:49).

Test units A, B and C at Ch33 yielded evidence of clay lamellae formation, while the "T trench" extended to over 1m (4.5') below surface exposed an area of dark brown humic sand containing flakes and sherds that somehow "bore no relationship to each other" (1970:51 and Figures 14 and 15). Most artifacts from Ch33 were found in shallow or plow zone contexts and included a variety of Early, Middle and Late Woodland ceramics and arrow points (1970:53).

Examination of a bulldozer-cut profile at Ch28 led the UNC crews to open a series of nine 10' x 10' and four 5' x 5' excavation squares. Stratigraphy identical to that revealed in the 1968 test was revealed, consisting of a shallow plow zone overlying sterile clay subsoil. A slight textural and color change was noted for subplow zone soils in Units 230R110 through 260R110 and was designated Levels 1 and 2. Three concentrations of fire-cracked

rock were defined at the Level 1-2 interface, one of which contained a Middle Archaic Stanly point. In conjunction with miscellaneous rocks scattered randomly across the exposed site area, these features were interpreted as:

archaic hearths lying directly upon an old ground surface. In all probability the site was seasonally used and contains an infinite (sic) number of surfaces building up much like coats of wax on a table surface (McCormick 1970:66).

Neither the mechanisms for this site formation nor the locations of the several ground surfaces are further explained by McCormick. Figures 18 and 19 of his report illustrate the general mixing of site deposits with over 77 percent of all point forms and 74 percent of all lithics occurring in the plow zone. Kirk, Stanly, Morrow Mt., Guilford, Yadkin and Hillsboro forms were identified, which represent site occupations over 9000 years. In like fashion, 99 percent of all ceramics were found in the plow zone or Level 1 of the site deposits (McCormick 1970:Figure 25). Based on available information, the site might have been better interpreted as the remains of many occupations collapsed into a few fairly compact soil zones. It is interesting to note, however, that Middle Archaic forms, especially Morrow Mt. II varieties, constitute a majority (54%) of the recovered total (McCormick 1970:Figure 18).

By 1970, McCormick's interpretation of the original test excavation at 31Ch29, where a few items were found in the plow zone, had changed to state that the site was "deeply stratified" (1970:65). Several test "holes" of varying sizes were placed across the site during the 1969 field season, one of which was extended to 6.5' (1.9m) below surface before terminating at a layer of "compact orange clay with gravel". Numerous "percolation lines" were noted on the profile drawings. Another test revealed a feature containing fire cracked rock, sherds, triangular arrow points and calcined bone fragments. Six contiguous 10' x 10' units were subsequently opened in an attempt to recover more data on the Woodland occupations of the site (McCormick 1970:67 and Figure 21).

The 1969 block excavations at 31Ch29 produced data in several forms, including between 11 and 15 features (five were later determined to be rotted or burned tree stumps) (1970:67, 70). Many other disturbances are depicted on plan drawings of the excavation which are not explained as to origin or nature. Excavation and analysis of the features indicate that most were refuse pits or shallow depressions filled with mixtures of charcoal, FCR, debitage, mussel shell and calcined bone. Pottery was recovered from several features and at least four contained historic "trade" items in the form of glass beads, kaolin pipe fragments and metal objects (1970:70). No attempts were made to date feature contents by radiocarbon or other methods, such as kaolin pipe bore diameters (Binford 1962b) but arrow points and ceramics contained in the fills were assigned on typological grounds to the Middle and Late Woodland periods (Uwharrie-Hillsboro) (McCormick 1970:72, Figures 23 and 27).

McCormick's interpretations of the site occupational history thus evolved from limited exposure of deeply buried levels in Test 3 and a concentration on the plow zone and immediately sub-plow zone deposits. A "concentration of archaic artifacts" had been noted for Test 3, between 3.9 and 5.1' (1.2-1.6m) below surface, but had not been explored further (1970:67). A date of 5000 B.C. is assigned to those materials, although no identifying Middle Archaic artifacts are accounted for in the report. Further interpretation of those data in light of the most recent excavations at Ch29 is hampered by McCormick's site map (Figure 20) which, when compared to a later map by Wilson (1976:Figure 2), places Tests 1, 3, 4 and 6 somewhere off the edge of the "levee" or terrace onto the low floodplain of the Haw River.

The Woodland or Developmental stage occupations of Ch29 were interpreted by McCormick as "shorter" than the Archaic (Uwharrie) or "very brief" (Hillsboro-protohistoric) (1970:72). The contiguous excavation of six 10' x 10' squares and most test units had exposed only shallow, disturbed deposits with numerous pits, roots and tree disturbances. No clear understanding of the potential stratification of cultural remains can be gained from his data since, with the exception of Test 3, virtually all artifacts were found in the plow zone or in intrusive features. Additionally, no information is presented on the horizontal distribution of items within the plow zone.

Mixing of Woodland stage ceramics, lithic tools and Euro-American artifacts in the feature fills and general plow zone levels led McCormick to hypothesize that: 1) a transition period(s) was represented or 2) earlier materials were disturbed by excavation and filling of historic period refuse or storage pits (1970:72-73). While his evaluations of site occupancy are made entirely on typological separations, it would be extremely hazardous to pursue the idea that a 1000 to 1200 year "transition period" from Middle Developmental through early Historic stages can be discerned. The second idea, that cultural levels are disturbed, is much more tenable, although little effort was made to determine if, in fact, undisturbed levels existed below the plow zone. McCormick's final interpretation of the late prehistoric and early Historic date from Ch29 is that a *permanent village* (our emphasis) occupied the site, but that "the 1969 excavations just touched on its periphery" (1970:99). Little or no evidence is contained in his report to corroborate these statements. Other than a few pits containing a mixture of Woodland stage refuse items, no post hole patterns, midden zones or other information is given from the main or subsidiary excavation that would substantiate that assertion, nor the further statement that "the archeological data indicates (sic) that the people living on Ch29 were the same ones that used Ch28 and Ch33" (1970:99).

Since his stated goal (1970:28) was to find stratified sites evidencing the complete spectrum of human occupations in the reservoir, it seems that McCormick failed to exploit an opportunity at Ch29 to do just that. His own preliminary tests had revealed superposition of Woodland and Archaic remains, yet except for a single unit, he neglected to follow that lead (1970:99). Additional excavations were, however, recommended for the site in order to pursue that goal (McCormick 1970:100). With the clarity of perfect hindsight, the 1969 field effort would have been spent more effectively digging deep test units rather than

the areally-extensive block excavation. Clarification of the Woodland, especially New Hope, chronology seems to have become an overriding force for his research, if the effort contained in the ceramic analysis portion of his thesis is any indication (McCormick 1970: 78-95).

The ceramic analysis performed by McCormick continued the research trend begun by Smith (1965b) which sought to demonstrate some typological, if not temporal integrity for the New Hope series. A sample population of 2546 sherds from 31Ch33, 29 and 28 was subgrouped according to traditional attributes of temper, surface treatment, color, thickness, etc. Subgroups thus defined were termed "series" and were argued to demonstrate internal consistencies of "attribute clusters" (1970:79). Actually, the concept of "cluster" as used by McCormick had no statistically demonstrated significance, but instead resulted from his sherd groupings according to traditional typological methods (Coe 1952, 1964; Coe and Lewis 1952).

Additional excavations at sites 31Ch29, 33a, 159 and 231 were conducted in 1974 by UNC crews under the immediate supervision of Jack H. Wilson, Jr. (Wilson 1976). The work served as a continuation of previous efforts aimed at examining complete stratified sequences of prehistoric occupations of the reservoir area. Sites 33a, 159 and 231 were reexcavated on the basis of recommendations made by McCormick, despite the fact that he found only eroded or shallow deposits (1970:39, 44, 47-55). Presumably, Ch159 was again selected because of the Hardaway component present in shallow plow zone deposits with Archaic materials, although Wilson (1976:65) continued to reason that undisturbed portions of the site might be present. His subsequent excavations at the three sites served primarily to reaffirm what was already known about their stratigraphic integrity, and cultural components, although respective artifact inventories were increased (1976:62-70).

Wilson's efforts, hampered by exigencies of weather, roads and water levels, centered on additional data recovery of 31Ch29. Despite his stated adherence to the goal of finding stratified cultural sequences (1976:1-2), energies were directed at producing more information on the late prehistoric site components. As he stated (1976:10):

It was with an eye towards isolating the main occupation area of the site and hopefully finding information pertinent to the temporal placement of New Hope ceramics that excavations were resumed in 1974 at 31Ch29.

This, of course, disregarded certain of McCormick's findings of deeply-buried Archaic materials, a lack of confirmatory evidence for a Woodland "village" and the questionable construction of the New Hope ceramic series by Smith and McCormick.

Wilson's excavation plan at Ch29 involved an expansion of McCormick's major block by opening 14 - 10' x 10' units contiguous to the original excavations. Five 5' x 5' test units were arranged along the "levee" south of the main unit in attempts to define site boundaries. A sixth, designated Test Pit 7, was placed some 350 ft (107m) north of the main

excavation area, potentially within the same general area on the north end of the terrace segment explored by Commonwealth archeologists in 1979 (this report). Unfortunately, attempts to correlate our work with that of McCormick and Wilson were hampered by mapping discrepancies, or misrepresentation of physical features which prevented accurate relocation of original units (McCormick 1970:Figure 20; Wilson 1976:Figure 2).

Given Wilson's stated objectives, his decision to expose large areas was sound. Limited use was made of deep tests, which compromised any adequate examination of stratified remains. A majority of the units (approximately 90 percent of the total exposed surface area) was excavated only .2' (6cm) below plow zone, leaving deeper remains unexplored. Three deep tests were planned in Test Pits 1 and 2 and square 120R90 but were only partially successful in revealing the extent and nature of pre-Woodland site occupations. Apparently, only one of the three exposed the full depth of site deposits and complementary stratigraphy (Wilson 1976:17-24).

Recovered data on Woodland occupations of 31Ch29 included a variety of ceramics, lithic tools and debris, ethnobotanical remains and some historic items that basically duplicate those reported by McCormick (1969, 1970). Twelve additional features were defined, containing fire cracked rock, bone, ceramics, lithics, daub and ethnobotanical remains. Distinctive items include specimens assignable to Middle through Late Developmental and Early Historic times such as New Hope, Uwharrie and Hillsboro ceramics and arrow points, gunflints, glass beads and pipe fragments (Wilson 1976:24-57). Again, as with McCormick's work, no radiocarbon or other dating techniques other than comparative typologies were applied to featural data.

No artifact concentrations or features were revealed in upper level excavations in the various test pits, so it was felt that the major site occupation during the Woodland and later stages occurred in the immediate vicinity of the large block excavation; this despite the fact that no patterns of features or postholes suggested the presence of houses or other structures (Wilson 1976:15, 17).

The deep testing program for Ch29 originally was to involve one 10' x 10' square (120R90) and a single 5' x 5' test unit (#1), excavated to examine the stratigraphy of the levee and to see if pre-Woodland occupations were present, a situation already confirmed by McCormick (Wilson 1976:12-13). Test Pit 1 was placed on the visibly highest portion of ground, southeast of the main block, while the 120R90 square was part of the main excavation, as well as "on that portion of the levee closest to the river and furthest (sic) upstream", on the presumption that there was the oldest portion of the levee, where initial occupations by Paleo-Indian and Archaic groups were most likely to have camped (Wilson 1976:12-13 and citing Coe:personal communication 1974). Test Pit 2 was excavated through subplow zone levels as well, after Test Pit 1 revealed stratified deposits in that vicinity.

Several problems arise when attempting to utilize the deep test information provided by Wilson. A minor point involves the nonspecified instances of using either 1/4" or 1/2" mesh screen, which undoubtedly affected artifact recovery rates, although debitage and other small artifactual remains were not tabulated for report purposes. Secondly, the single profile drawing (Wilson 1976, Figure 4) for square 120R90 does not accurately represent the natural stratigraphy of the site, as presented in Plate I of Wilson's report or as exposed in the recent excavations at Ch29 (this report). Without benefit of photographs, it might appear that the site deposits are cross bedded alluvial sands that would contain redeposited and displaced artifacts within a point bar formation, as originally interpreted by Commonwealth geoarcheologists (letter to Wilmington COE dated January 8, 1979). A very different geomorphologic situation actually exists there, however (this report - Chapter 6).

The main problem with interpreting Wilson's data, however, involves correlating cultural and natural levels within the site boundaries, based on his notes concerning depths at which artifacts or soil zones were discovered (1976:17-24). Since all depths are recorded as below surface, it is necessary to reconstruct site stratigraphy from the text and appended maps (Wilson 1976:Figure 2).

Despite premature termination of excavations by floodwaters, Test Pits 1 and 2 produced evidence for superposition of New Hope ceramics over Early Woodland Badin specimens, a situation duplicated in square 120R90. Identification of a supposed late Historic Randolph point in Early Woodland Levels of Test Pit 1 to a total depth of 5.17' (1.76m) below surface where digging stopped at a layer of "friable sandy-red clay". It is unknown whether this represented the sterile basal clay layer exposed in Commonwealth's 1979 excavations at Ch29.

Square 120R90 constituted the single successful attempt by Wilson to explore the deeply stratified deposits at Ch29. Surface elevation of the unit can be estimated at 99.5' (arbitrary) which is some two feet below the surface elevations for Test Pits 1 and 2 (Wilson 1976: Figures 2 and 4). Cultural materials were found to be a total depth of 4.97' (1.5m) and the unit was extended to at least 5.19' (1.6m) BS, at which point excavation ceased *without* encountering a clay zone as in Test Pit 1 (Wilson 1976:21). Comparative data then indicate that a clay level was reached in Test Pit 1 at approximate elevation of 95.8' (29.2m) but was not indicated in 120R90, some 1.5' (.5m) lower (94.3' or 28.7m). Either Wilson failed to excavate the entire sequence in Test Pit 1 or a major elevation discrepancy exists in that area within what are basically horizontal natural deposits (this report - Chapter 6).

The 120R90 excavation did reconfirm the presence of buried Archaic components at 31Ch29. Late Archaic Savannah River points (2) and miscellaneous debitage were recovered immediately below the Early Woodland Badin materials in 120R90 between the depths of 2.65' and 4.97' (.81-1.51m). Six identifiable Kirk points, one fragment, 13 bifaces, hammerstones, a uniface and miscellaneous flakes (674) were contained in slightly over 70 cm of deposit. Two features were also defined which unfortunately yielded no cultural materials (Wilson 1976: 20-21, 30).

Wilson's analysis of artifacts from 31Ch29 included 2581 sherds, some 200 stone tools and miscellaneous historic artifacts (beads, pipe fragments and gunflints). Materials recovered by McCormick (1970) were apparently not reanalyzed, nor was the debitage (5800 specimens) or ceramics from "disturbed situations."

Although sherd counts disagree between the text and tables (1-3), at least 94 percent of all ceramics accounted for by Wilson were recovered from the plow zone or Level 2A, a situation duplicated by McCormick (1970:Figure 26) who found over 98 percent in the plow zone at Ch29.

Faced with this situation, Wilson again resorted to separating and identifying ceramic types according to combined attributes of temper, surface treatment, etc. Interpretations were then based on comparative typologies and dating with other Piedmont site assemblages. Numbers and relative frequencies for each recognized type are as follows, based on the figures included in Wilson's Tables 1-3:

Badin	9	.4%
Uwharrie	1020	40.6%
New Hope	1261	50.1%
Hillsboro	225	8.9%
N —	2515	100%

The 1976 analysis of excavated ceramics thus produced a fairly even division between New Hope and Uwharrie series sherds, with minor amounts of Badin (found in the deep tests) and Hillsboro. Variability inherent in the New Hope series initially recorded by Smith (1965b) and McCormick (1970) is reiterated by Wilson, although his chronological interpretations differ. He argues for a Late Developmental, rather than Middle Developmental series.

Wilson, like Smith and McCormick, recognized New Hope sherds mainly on the basis of feldspar tempering, while ignoring the similarities of other attributes with Uwharrie and newly discovered Badin ceramics from Ch29 and other sites in the reservoir. Smith and McCormick attempted to place New Hope ceramics, on the basis of the identifying temper, intermediate between Badin (sand-) and Uwharrie (quartz-tempered) series. Wilson diverges from that line of reasoning, preferring to use surface treatment as a chronologically sensitive variable. A majority of the New Hope sherds from the 1974 excavation lacked any surface treatment other than smoothing (plain), a trend also documented by McCormick (88 percent plain) (1970:Figure 26). This attribute was felt to substantiate a Late Development placement, in combination with a single New Hope simple-stamped sherd and a "sugary" texture which Wilson likens to the Mississippian Pee Dee ceramic series from the southern Piedmont (Wilson 1976:37; Reid 1967).

Lack of associated Middle Development lithic tool forms (especially projectile points) is cited as further evidence for this argument. Again, however, it should be remembered that almost all ceramics, including those labelled New Hope, were discovered in plow zone

deposits, associated with projectile points identified as Early and Late Archaic, and Early through Late Woodland and Historic (Wilson 1976:Table 5). A significant number of point specimens remained unidentified (21 percent) which could possibly represent "Middle Developmental" forms; likewise, since parallels were drawn between New Hope ceramics and series from the Roanoke Basin, on typological grounds it might have been profitable to consider point styles in the same fashion (Coe's Roanoke-Vincent-Clements continuum), rather than utilizing a southern Piedmont Badin-Yadkin-Uwharrie framework (Coe 1964: Figure 116). The analogy between sherd textures of Woodland New Hope and Mississippian Pee Dee ceramics should also be regarded with caution.

Summary evidence for 31Ch29 accounts for site occupations from at least the Early Archaic through Historic times, based on the presence of diagnostic artifacts ranging from Kirk points through items of Euro-American manufacture (gun-flints, glass beads, etc.). A single Paleo-Indian Hardaway-Dalton point was found out of context during the 1974 excavations, but suggested the presence of earlier site occupations, as did the nondiagnostic materials underlying Kirk horizons in 120R90. The unresolved issue of temporal placement for the New Hope ceramic series remained for Wilson at least, the more "perplexing" problem (Wilson 1976: 58).

Since the University of North Carolina projects, archeological investigations within the B. Everett Jordan Reservoir have consisted of surveys and/or excavations within more limited areas (Autry 1976; Newkirk 1979; Adams et al. 1979; Mueller et al. 1979). Periodic, but unreported collections of site data by personnel from the Research Laboratories of Anthropology and the Wilmington District COE have continued, as have excavations at site 31Ch366 by Commonwealth.

Information gained through recent and ongoing projects has tended to flesh out the basic prehistoric occupational frameworks of Smith, McCormick and Wilson. They had each recognized patterns of frequent, yet ephemeral Paleo-Indian and Archaic occupations of hills, terraces and similar features, with a subsequent concentration of Woodland and Historic stage sites along the major stream valleys of the New Hope and Haw Rivers (Smith 1965b:149-157; McCormick 1970:96-100; Wilson 1976:70-71). Of the three, Wilson conducted more excavations (directed largely toward Woodland occupations) from which he concluded that Developmental (Woodland) usage of the Haw River Valley was minimal and, further, was almost nonexistent along the New Hope (Wilson 1976:70-71). With the latter exception, of course, the conclusions of the three UNC investigators coincide with extant Piedmont settlement-subsistence models (Coe 1964; Mathis 1979).

Certain trends in research orientations and methodologies can be recognized for reported archeological investigations in Jordan Reservoir. The earlier works (pre-1978) were not concerned generally with concise problem orientations on rigorous evaluation techniques, which eventually have limited their value for resource management purposes. Survey efforts by Smith (1965a, 1965b), McCormick (1969, 1970), Wilson (1976) and Autry (1976) apparently proceeded as open-ended programs of site data collection and descrip-

tion, with only a very few explicit research directives. No survey sampling designs based on environmental or cultural variables were employed and, in several instances, recommendations of previous investigators were disregarded, resulting in a significant amount of duplicated effort. Stated research goals included discovery of stratified sites and resolution of the New Hope series question. Substantial efforts were never devoted to resolution of the first objective, nor was the second goal ever realized. Reintegration of the original reservoir site data into recent analytic framework has been further hampered by failures to analyze or even describe the majority of sites (350-odd) in more than a cursory fashion.

Post-1978 investigations have tended to embody the goals of cultural resource management (CRM), which centers on adequate treatment of data in response to guidelines set forth in state and federal legislation (McGimsey and Davis (eds.) 1977; Schiffer and Gumerman (eds.) 1977; Moratto and Kelly 1978). Recently employed methodologies such as systematic shovel-testing, computer mapping and rigorous sampling strategies also reflect a growing sophistication in survey and evaluation techniques, again responsive to the needs of cultural resources management archeology (Goodyear, Raab and Klinger 1978; King 1978; Plog et al. 1978).

Since 1974, archeological investigations in the reservoir project area have involved general reduction in the specified areal extent of work. That situation has also facilitated implementation of more systematic data recovery and analysis procedures. As a result, the end products of recent studies (Adams et al. 1979; Newkirk 1979; Mueller et al. 1979) have become more comprehensive, less subjective evaluations of discovered sites and their contents.

CHAPTER 4 ARCHEOLOGICAL METHODS

EXCAVATION AND FIELD LABORATORY STRATEGIES

This report section constitutes a summary of the particular archeological techniques performed at the Haw River site group. Since the sites had been subjected to a long history of excavations and collections, including Commonwealth's Phase I work, little of what we found was totally unexpected. What is of greater importance, however, is that our excavation strategy was formulated to extract in a very systematic manner the types of data we anticipated from these deeply-stratified, areally-extensive sites. Rather than tailor the excavation strategies to fit our particular logistical or personnel situations, we designed the excavations around larger analytic and interpretive goals. Preliminary efforts had demonstrated that a fairly complete chronological spectrum of prehistoric occupations was present in well-preserved spatial contexts. What we were faced with, then, was the extraction of an optimally complete data set relevant to a pre-determined group of research goals dealing with both synchronic (horizontal) and diachronic (vertical) arrangements of cultural remains.

Commonwealth's investigations at 31Ch8, 28 and 29 involved a preliminary Phase I surface collection, a mapping and testing program, and a more intensive Phase II excavation effort. Phase I provided up-to-date information on the extent and condition of site remains, given recent land surface alterations performed in connection with reservoir construction. Phase I testing of geological and archeological deposits also contributed to major revisions of previous interpretations of the mechanics of site formation on the Haw River floodplain and led to an immediate re-evaluation of the sites' archeological significance. Phase I findings were reported to the Wilmington COE in July 1979; an integral part of that report was a series of recommendations for impact mitigation based on our observations. Several general research questions were developed at that time, along with specific field and laboratory techniques necessary to address those questions.

Our Phase II excavations thus proceeded from a base of prior knowledge. Rather than excavate the sites and then formulate questions addressable by the data, in an *ex post facto* manner, we carefully strove to formulate a research design (Binford 1964b) based on all available information (see Chapters 1 and 3).

The following discussion includes both our Phase I and II field efforts. We hope this will allow the reader to understand how our sequential investigations were interrelated and goal-oriented. As mentioned, Phase I consisted of mapping and controlled surface collections of artifacts over the 32ha area designated by COE archeologists as the study area. Collected information was augmented by limited mechanical and hand excavations to

evaluate subsurface geological and archeological remains. The results of those efforts are summarized in Chapter 1; they are detailed in the Phase I report submitted to the Wilmington COE under Contract DACW54-79-C-0020.

Phase I

In order to adequately determine the extent and nature of surface remains at the Haw River site group, a Cartesian grid system 400m E-W by 800m N-S was superimposed over the main site area, as determined by COE archeologists. Two hundred individual grid units 40m on a side were laid out, using a transit, stadia rod and 50m tapes, with corners marked by surveyor's flags bearing appropriate corner designations relative to the grid origin point. Elevations for each of the 224 unit corners were recorded and eventually used to produce a contour map of the gridded area. Elevations were recorded also for topographic features that did not happen to coincide with grid unit corners.

Within the 32ha area thus delineated, we systematically surface collected all lithic and ceramic specimens within random 1m square subunits from each of the 40m grid units. In addition, general collections of lithic tools, debitage and ceramics were made from the 40m units to control for "diagnostic" forms that otherwise would have been ignored. All specimens were placed in collection bags marked with appropriate square designations (e.g., E260S420) and collection procedure ("random" or "general"). Data collection sheets recording artifact density, surface visibility and local topographic characteristics were completed for each grid unit as well.

Given the fact that the Jordan Reservoir dam was already completed and the site area had been totally inundated at least once during the winter of 1979-1980, we anticipated that a portion of the collection area would be obscured by recent silt deposits. Estimates of the extent of siltation, made during erection of the grid system, were that 60 to 65 percent of the area was covered by 4 to 6cm of recent deposits. Since this situation effectively precluded surface examination of most of the area, particularly in the vicinity of the three known sites, a contingency plan of limited test excavations was undertaken. Rather than collect no artifactual data from affected grid units, we excavated randomly selected .5m square test pits within the larger grid units. Disturbed plow zone levels were removed as the first level and subsequent levels were extended in 10cm increments. All fill was passed through .25 inch mesh screen, soil profiles noted and necessary data sheets completed.

Data gathered by these methods were analyzed in terms of several categories, including temporally sensitive diagnostic forms, raw materials and stages of reduction. Those variables were coded and analyzed using the Harvard Graphics Laboratory SYMAP computer contouring program, which generated graphic displays of artifact and raw material types in relationship to topographic features within the grid area.

Concurrently with the mapping and surface collection/test excavation operations, Commonwealth geoarcheologist Curtis E. Larsen directed the excavation of several backhoe

trenches across the site area in order to explore and perhaps explain the apparently complex geomorphologic processes affecting site and, hence, artifact distributions. A representative east-west cross section of the floodplain deposits was obtained first, through a series of eight trenches extending perpendicular to the axis of the river. Important stratigraphic differences were revealed in this manner between the highest, oldest eastern terrace system, the intervening, low-lying backswamp area, and the elevated terrain along the river slough which contains sites 31Ch8 and Ch29.

Twelve additional backhoe trenches were placed judgementslly in the areas of all three sites. They provided confirmation of geomorphologic conditions but were primarily intended to reveal information on the depth, extent and integrity of archeological remains. The success with which that latter task met is ultimately evident in the archeological investigations contained in this report.

Phase II

Phase II of the Haw River site group data recovery program constituted the major, and final, effort for salvaging archeological and geological data prior to inundation. Phase I work, in combination with excavations performed earlier by University of North Carolina crews (McCormick 1970; Wilson 1976) had demonstrated the presence of well-preserved, naturally and culturally stratified archeological remains to a depth of approximately 1.5-2.0m below surface (Mueller et al. 1979). Several research goals had been posed which required the recovery of both stratigraphic and areally-extensive data sets, e.g., the physical arrangement of artifacts, features and other data classes as preserved in archeological contexts. To that end, we proposed to open several large "block" units, which would provide the necessary horizontal control over artifact distributions, and excavate them in very small (5cm) vertical increments (levels) which would furnish vertical and chronological controls over our data.

Original plans, based on Phase I findings, were for the excavation of three 12m x 12m blocks, using controlled hand excavation techniques in combination with mechanical removal of overburden or sterile soil horizons. Location of the blocks (at 31Ch8 and 31Ch29) was to be determined by the location and nature of previous excavations of Commonwealth and UNC crews (see Chapter 1; McCormick 1970; Wilson 1976; Mueller et al. 1979).

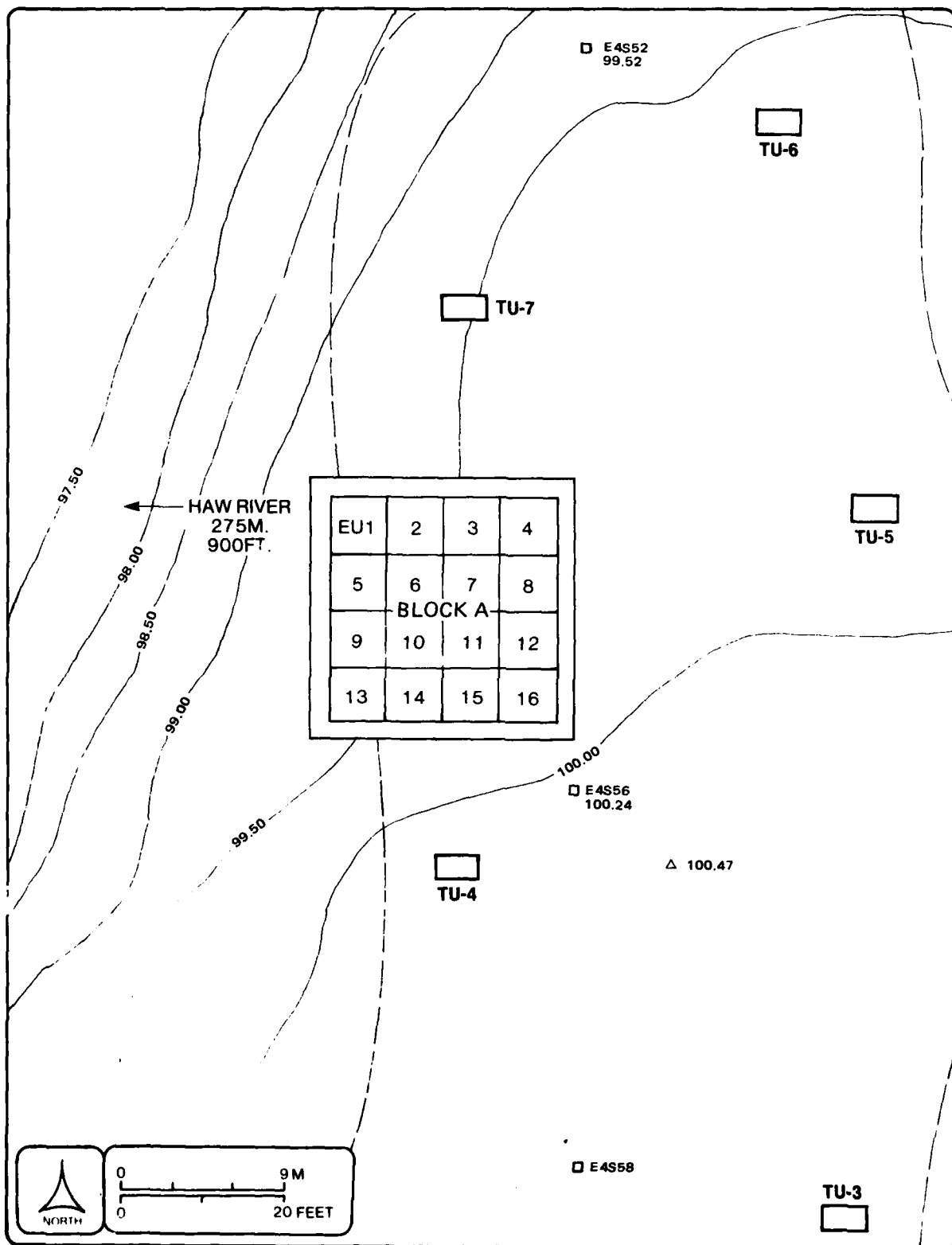
A series of ten 1m x 2m hand-excavated units were to be placed across the two sites in order to test for and evaluate the presence of Late Archaic and Woodland components. Major excavations by UNC crews over the last decade had extensively explored those remains, particularly at 31Ch29, resulting in several publications, and it was felt that additional excavation of those site elements was unnecessary. This was especially true given the time constraints placed on our work by anticipated reservoir inundation in winter of 1979 and by the significance attributable to the unexcavated Archaic remains present at the sites.

Excavation strategies therefore concentrated on the stratigraphic testing of later components and an emphasis on earlier Archaic elements. Major excavation blocks (12m x 12m) were to be centered within larger 14m x 14m areas mechanically stripped of the approximately 1m of plowzone and immediate sub-plowzone containing the sampled Late Archaic and Woodland artifacts. Sixteen 3m x 3m excavation units ("EUs") were designated within each block, each further subdivided into nine 1m x 1m units ("squares"). Shovel-skimming and trowelling of arbitrary 5cm levels within each of the 144 squares thus provided very close control over the types of spatial data needed to address our research goals (See Figures 4.1, 4.2, and 4.3).

Due to contingencies of scheduling and manpower, and several unexpected archeological discoveries during the course of work, the initial excavation plans were considerably modified. Two large blocks, one 12m x 12m and one 9m x 9m, were completely excavated; two others were begun but not completely excavated. A total of 14 test units ("TUs") were dug, rather than the ten planned. Dimensions of TU's also varied somewhat — eleven 1m x 2m units, one 3m x 3m unit and two 2m x 3m units. A linear total of almost 200m of backhoe trenches was excavated to an average depth of 1.5-2.0m to provide additional data on geological/archeological strata and guide the placement of the block units. Certain long backhoe trenches served dual purposes by exposing long stratigraphic sequences along the lines of pipelines dug for installation of passive groundwater drainage systems around the blocks.

Actual controlled hand excavations of some 350 cubic meters were accomplished during the fall 1979 field season. Minimal standards and procedures for the processing of that excavated volume are detailed in the following paragraphs. At site 31Ch29 a large (12m x 12m) block was excavated to a depth of over 2m, along with seven 1m x 2m sampling test units; 31Ch8, which was found to extend well beyond the originally recorded boundaries, also was excavated with a large (9m x 9m) block unit, as well as two other blocks (abandoned due to evidence of erosion or other disturbances). Four 1m x 2m units, one 3m x 3m unit and two 2m x 3m units were also dug at 31Ch8, mainly to gather stratigraphic data on unexpectedly deep deposits near the north end of the site. Both 31Ch8 and 29 were extensively trenched, using a tractor-mounted backhoe, for purposes of geological and archeological examinations of the deeply-buried deposits.

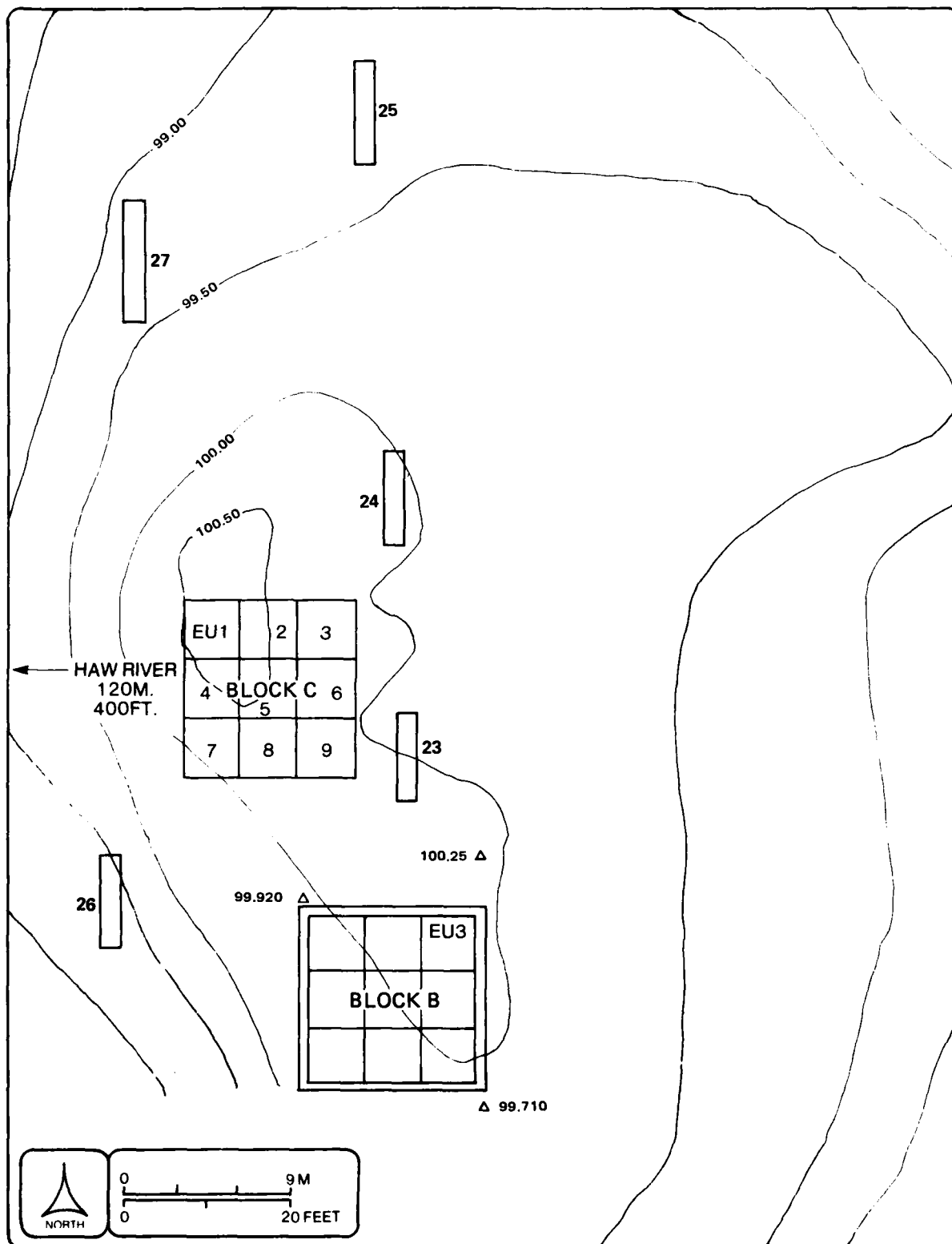
The principal excavation technique employed for removal of soil matrix in both test units and block excavation units was flat shovel-skimming. This served as an efficient means for removal of the soil while providing a precise method for uncovering *in situ* artifactual materials. After removal, all fill materials were placed in wheelbarrows for transportation to the water screening station. Excavators worked in single 1m x 1m gridded squares within the larger 3m x 3m excavation units. Five cm arbitrary levels were removed sequentially from each of nine 1m x 1m grid squares in an EU. The initial 1m x 2m test units were treated somewhat differently due to their limited size and the different types of data which were sought during their excavation (stratigraphic, rather than horizontally spatial). The entire 2m square surface area of the TU matrix was excavated to the 5cm arbitrary level depth as a unit, rather than dividing the test unit into two 1m x 1m x 5cm grid squares.



DATA RECOVERY AT SITES 31CH29 & 31CH2
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA

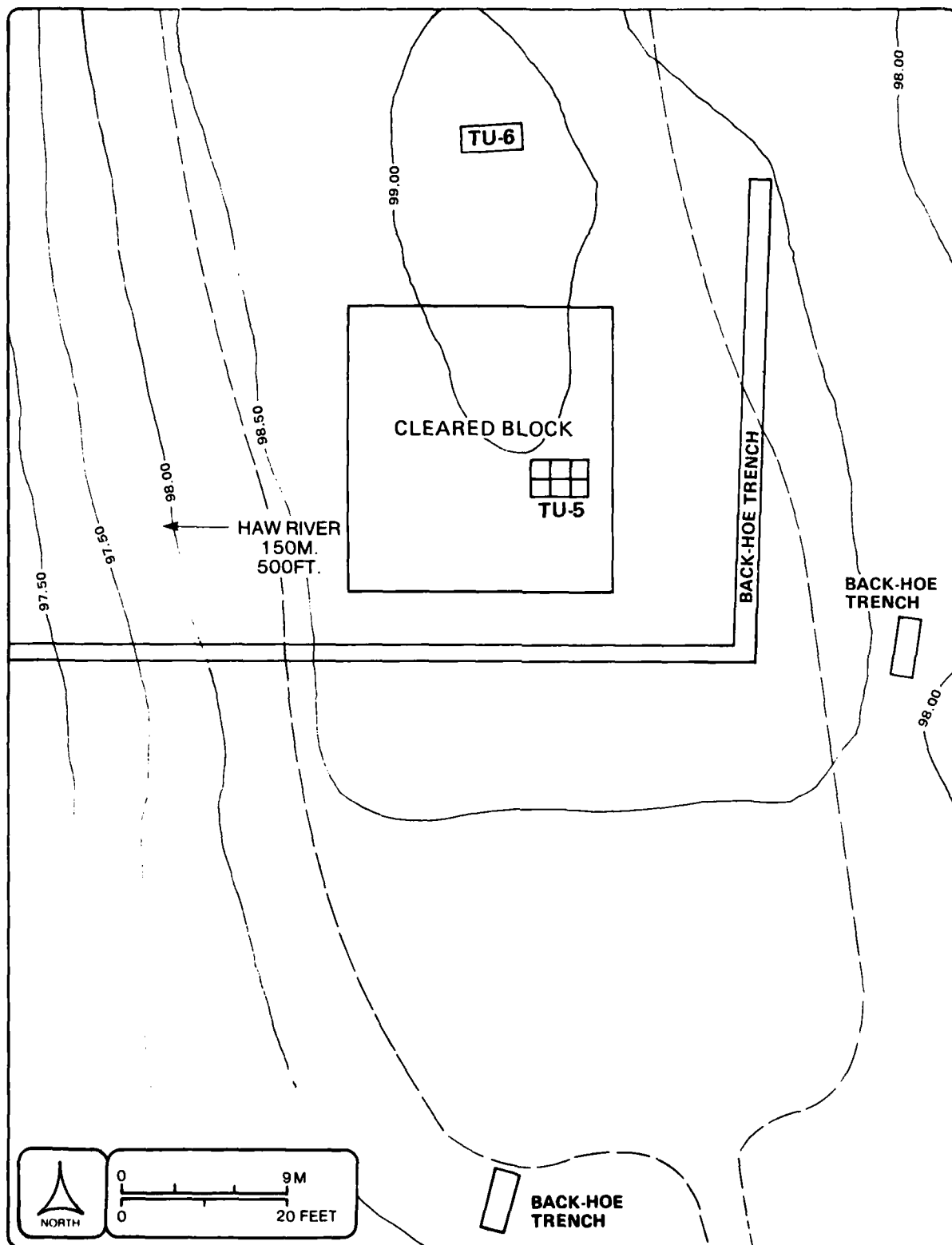
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FIGURE 4.1
 EXCAVATION PLAN-
 31CH29



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA
 COMMONWEALTH ASSOCIATES, INC.

FIGURE 4.2
EXCAVATION PLAN-
31CH29, NORTH SECTION



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA
 COMMONWEALTH ASSOCIATES, INC.

FIGURE 4.3
EXCAVATION PLAN-
31CH29, CENTRAL SECTION

The excavation technique of shovel-skimming, when coupled with the system of data recording and artifact piece-plotting just described, relied heavily on the use of the 1m x 1m grid square as a unit of provenience control. Within each 3m x 3m excavation unit, nine 1m x 1m squares were gridded-out previous to the excavation of every 5cm level. Each of these squares was given a letter identification (a, b, c . . . i) when excavated and served both as a spatial locator and as a sampling unit for artifacts and debitage found in each level. Excavation and recording in this manner elicited efficient and controlled data recovery. Any tools, flakes, or pottery which had escaped individual piece-plotting during the shovel-skimming process, and were subsequently found during the water-screening process, could therefore be identified as originating from a single 1m x 1m grid square in a specific 5cm level. These artifacts therefore retained a highly specific provenience despite the fact that they had not actually been found *in situ*.

The excavators digging and troweling in this highly controlled manner were more aware of subtle changes in the archeological deposits. This could be seen not only in changes of tool artifact occurrence and flake densities, but also in changes of soil color and texture, fire cracked rock occurrence and rock cluster types, and in the presence or absence of faunal remains and charcoal samples in the soil matrix being excavated. Many of these changes are usually indicative of the presence of features and activity areas, especially when they mark abrupt boundaries. Features and artifact cluster areas are the loci of site activity, the identification of which is of paramount importance in the interpretation of archeological sites.

Discovery of those activity loci was incorporated by the field director and supervisors into the larger excavation stratigraphic setting. This facilitated qualitative and quantitative data recovery throughout the site as the excavation progressed. Thus even the smallest portion of a feature exposed during the shovel-skimming excavation of a 1m x 1m square alerted the excavator to the feature's continuance into adjacent 1m x 1m squares, either within that individual's excavation unit or within an adjacent 3m x 3m excavation unit. Having been alerted to the occurrence of features, artifact clusters, etc., within certain levels of the soil matrix, the field director and supervisors could amend the excavation techniques being performed in other areas of the excavation. This insured thorough data recovery in those portions of the site which had not yet been excavated to and through that level.

Piece-plotting or point proveniencing was used in combination with hand trowelling whenever tool artifacts, fire cracked rock, flakes (greater than 30mm in minimum dimension), clustered artifacts, or features (organic stains, charcoal lenses, etc.) were encountered. In the case of single artifact proveniences, distance measurements were noted with reference to two adjacent boundaries of the excavation unit (e.g., north and west, south and east). The third (vertical) dimension was provided by a plumb line measurement from one of four line-leveled datum strings attached to posts in each of the four corners of the excavation unit. One-half inch (i.d.) steel electrical conduit was used for corner posts. Elevations for each post were calculated by use of transit, rod and tape. The nearest datum point was used to minimize vagaries of string tension when calculating artifact proveniences. Provenience information was recorded on EU tool inventory sheets and also was graphically

plotted, by using an artifact identification symbol and number, on excavation unit level sheets (Appendix 2). Upon completion of the systematic removal of the total 5cm level from all nine of the 1m x 1m grid squares, all artifacts contained within that level were thus individually plotted and identified on the EU level sheet. Features and artifact clusters were routinely pedestalled during the course of excavation for later examination and removal after the excavation in adjacent 1m x 1m squares had progressed through several levels.

All materials which escaped detection during the shovel-skimming process, and which had not been point provenienced, were necessarily contained in the excavated soil matrix. Treatment of this soil matrix was generally the same for both the test units and excavation units, the only difference being the volume of soil individually examined during the water screening process. As previously mentioned, the basic unit of excavation in EUs was a 1m x 1m grid square with a depth of 5cm, while the subunit of a test unit measured 1m x 2m x 5cm. Volumetrically, each excavator handles twice as much fill for each level of a test unit as an excavation subunit (100 versus 50 liters).

The soil matrix routing procedure can be explained by using a volume removed in an EU square as an example. A 1m x 1m x 5cm soil volume would be shovel-skipped from each of the nine grid squares within an excavation unit. This matrix (e.g., Block A/EU5/SQ4/LEV3) was then transported to the water screens for processing. Water was pumped out of an adjacent slough of the Law River by gasoline engine pumps and was used to wash the soil matrix through screens made with .25 inch mesh hardware cloth. Materials remaining in the screen were separated into classes — tools, pottery, lithic debitage, faunal remains, or debris (roots, pebbles, etc., to be discarded), and dried on a sorting table. Water screening also served to effectively clean most artifacts in the field, which effected a significant cost savings during laboratory procedures. Artifacts were assigned temporary numbers or letters, recorded on tool inventory sheets, and bagged according to the procedures set up for field processing. Recording procedures are discussed later in this section, along with a description of the color coded index system designed to segregate the various types of field samples.

Materials removed by using these excavation techniques and stringent provenience controls were also involved in a field laboratory presorting and processing system. To accomplish initial processing and preliminary field analysis, a system was instituted which utilized color coded index cards to segregate the several categories of excavated samples. The system was originally developed for the excavation of 44LD3 at Lowes Island, Virginia (Larsen et al. 1979), and was refined for use at the Jordan excavations.

Materials collected in the field during excavation were sorted into the following eight categories: debitage, tools, ceramics, fire cracked rock, carbon samples, fine screen samples, pollen samples, and soil samples. The first four categories (debitage, tools, ceramics, and fire cracked rock) were those most frequently encountered.

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THE HAW RIVER SITES: ARCHAEOLOGICAL INVESTIGATIONS AT
TWO STRATIFIED SITES. (U) COMMONWEALTH ASSOCIATES INC
JACKSON MI S R CLAGGETT ET AL. APR 82 2386-VOL-1

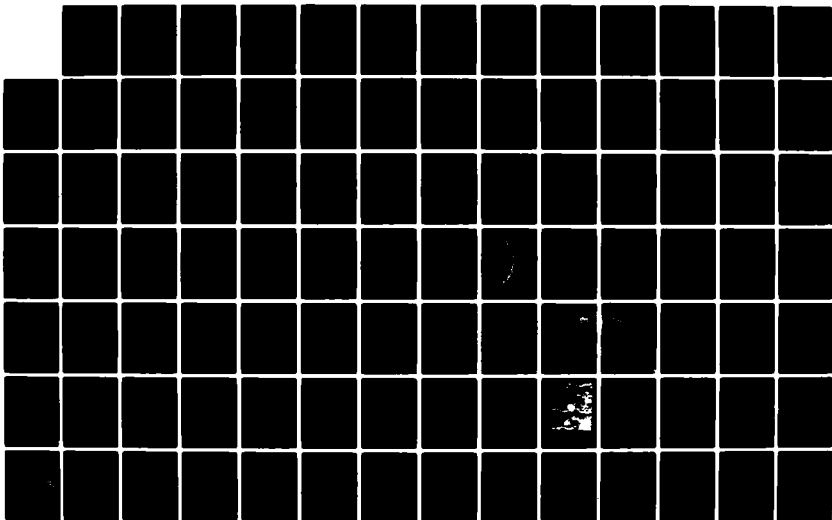
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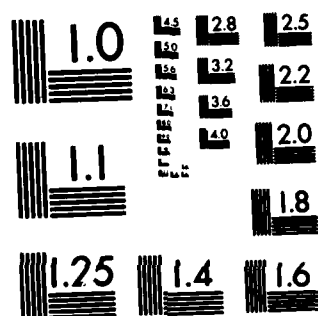
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Debitage was the most prolific of the eight categories. The class includes all non-piece-plotted, non-diagnostic lithic debris that was contained in excavated soil matrices. Debitage found in features, or piece-plotted, was excluded from this bulk debitage category at the field laboratory stage. After waterscreening, debitage was rough-sorted from other materials (e.g., tool fragments, pot sherds, etc.) and was air dried at the processing table. Debitage from each 1m x 1m x 5cm square was subsequently placed into individual "ziplock" plastic bags containing a yellow provenience card, whose color identified the contents of the bag. Provenience information and brief associational descriptions were included on these cards for control purposes during the field phase and for future reference during laboratory cataloging and analysis.

At the field lab, debitage samples were unbagged and re-examined for the presence of any tools or tool fragments overlooked during the initial rough-sorting. Samples were counted and tabulated, allowing monitoring of changes in the spatial density (vertically and horizontally) of lithic debitage during the course of excavation.

Lithic tool specimens were piece-plotted *in situ* immediately after they were uncovered by excavators. This artifact category includes all tool forms that were morphologically recognizable and identifiable by using conventionally accepted terminology (e.g., projectile point, biface, uniface, cores, utilized and retouched flake tools, and various tool fragments). Plotted tools were numbered sequentially for each 5cm level of specific test or excavation units. As each tool was assigned a number and listed on the tool inventory sheet (Appendix 2), the corresponding number was marked on the artifact with an indelible ink marker. Piece-plotted tools were also graphically located on the unit level sheets (Appendix 2).

Any tools discovered during the water screening operations were also listed on the tool inventory sheet. Those tools were numbered consecutively with the other sequentially numbered specimens, but no attempts were made to retroactively record their provenience other than by 1m x 1m square and level. All tools (plotted and unplotted) from a single 5cm level within the unit were then placed in small plastic bags containing a red provenience card. The red card identified the contents of the bag as tools and provided provenience data and association descriptions used in cataloging those artifacts.

After transportation to the field lab, tools were individually cataloged on index cards, with provenience data, artifact number and general tool type, along with a full-size outline drawing of their shape. Each tool was labeled with a catalog number and then rebagged.

Ceramics were piece-plotted and lettered (rather than numbered) sequentially during the excavation of each 5cm level only under certain conditions. If sherds exceeded 35mm in minimal dimension, and/or if they occurred in proximity to other sherds (i.e., denoting a possible ceramic feature) or other feature indicators (e.g., fire burned earth, etc.), then they were piece-plotted. All provenienced ceramics were wrapped in masking tape, identified with a sequential letter designation and placed in a small plastic bag. This bag was placed

into another bag containing a grey index card and other sherds found during water screening. The grey card indicated the bag contained ceramics and provided brief association descriptions and provenience data for the enclosed samples.

Fire-cracked rock was handled differently from the three types of samples just discussed. All fire cracked rock from a square and level was weighed in the field and discarded. Plotted fire cracked rock was counted and weighed separately from that found during the water screening. This separation was maintained in the event that the seemingly isolated plotted materials developed into actual concentrations (e.g., a rock lined hearth feature) as the excavation progressed. Concentrations could be recognized and identified as features from their earliest detection in the soil matrix. All fire cracked rock data on counts, weights and locations of plotted and non-plotted items were recorded on level sheets and data recording sheets for designated features.

The remaining artifact categories (carbon, fine screen, pollen and soil samples) were collected under the direction and discretion of the field director and supervisors.

Soil sample collection was the responsibility of the Commonwealth staff geoarcheologist. A number of soil columns were sampled in the various profiles of the large excavation blocks at 31Ch29 and 31Ch8. Analysis of the micro/macro sedimentological record at the sites has allowed reconstruction of the paleo-environmental and depositional history of these sites, as reported elsewhere in this report (Chapter 6).

Pollen samples (in soil matrices), carbon samples and fine-screen samples (from selected features or excavation units) were returned directly to the main laboratory, without processing in the field. Pollen and carbon samples eventually were forwarded to respective technical laboratories for analysis, and the fine-screened samples retained at Commonwealth's laboratories. Color-indexed provenience cards were maintained for each of these special samples throughout the excavation and analysis procedures.

As an exercise in field laboratory techniques, we found the color-indexed system to be very efficient, especially in connection with the use of clear plastic bags for the packaging of specimens. When combined with more traditional data level sheets and tool inventory forms, the color-indexing system facilitated visual inspections by excavators and supervisors when measuring work progress, completeness of data recording and the like. The standardized, visible cards permitted easy handling and sorting of artifacts in the labs as well, while alleviating the tedious chores of opening and reclosing bags and interpreting idiosyncratic techniques of data recording.

Excavation and field lab procedures were designed to complement one another, while providing easy access to data for field supervisors. As a long-term, intensive exercise in archeological excavation, the entire system functioned very well. Detailed records kept at the various stages of excavation and analysis (e.g., field notes, level sheets, tool inventories, field lab index cards, etc.) proved invaluable at many times when unravelling the inevitable problems of misplaced or mis-classified archeological specimens.

LITHIC CLASSIFICATION AND ANALYSIS PROCEDURES

Devising a lithic classification and attribute analysis program for the Haw River archaeological project required a procedure that could both achieve continuity with Coe's (1964) typology, and at the same time incorporate archeologists' changing perceptions of the function of lithic technologies in the operation of prehistoric subsistence-settlement systems. Implicit in traditional classifications, of which Coe's is representative, is the assumption that most, if not all, variation in the morphology of tools reflects specific differences in their intended functions (see Schiffer 1979:19). This classificatory principle supports the development of elaborate typologies that embrace a great amount of subtle variation in shape, retouch, manufacturing technique, and sundry other attributes of morphological diversity in tool assemblages. In essence, lithic technologies were viewed as analogous to a carpenter's kit consisting of an elaborate array of special tools, each conforming to a narrow range of size specifications and/or intended uses. European Middle and Upper Paleolithic typologies (see Bordes 1968 or Ronen 1971) are consummate examples of this approach. Each contains intricate lists of tool types, including numerous kinds of endscrapers, side scrapers, burins, perforators, hand-axes, etc., which are assumed to perform discrete tasks within a cultural system.

Beginning with Semenov's (1964) treatise, recent research directed towards the relationship between stone tool form and function has served to overturn this traditional understanding of lithic technologies. Schiffer (1979:19-20) attributes these changing perceptions to discoveries made through lithic use-wear experimentation and ethnoarchaeological investigations.

Early experimentation in lithic use wear (see Ahler 1971 or Goodyear 1974) made it apparent that form was not a reliable predictor of function. The uses of stone tools were independent of morphology. Ahler's (1971) microscopic study of wear patterns on projectile points demonstrated that tools of the same typological category could exhibit evidence of differing uses connected with their last incidences of deployment. This suggested that a single tool class could be recruited for multiple purposes. Hence, even the most formalized tools (and therefore the most specialized under the traditional viewpoint) within a lithic technology performed a series of different uses within an adaptive organization.

Goodyear (1974:19-30), by contrast, showed that at least one kind of morphological variation within a single tool class, Dalton points, had little or no association with functional change. Researchers in Arkansas and Missouri (i.e., Morse 1971) had noted for some time that Dalton points exhibited variability in blade width and shape undoubtedly resulting from resharpening episodes. Initial stage Daltons are characterized by excurvate blades while advanced stage points manifest straight to incurvate outlines. Although the advanced stage, morphologically resembled drills, they displayed the same edge dulling from tip to shoulder as initial stage points which were used as knives. Just as life-history staging produces morphological change in projectile points, it is also a factor in the definition of less formal

tool classes such as retouched flakes or unifaces, and could serve to confuse and complicate classifications based purely on morphological variation. Resulting typologies may contain categories of unifaces or retouched flakes based on edge shape, amount of retouch or edge angle which reflect life-history stages rather than discrete activities or uses.

Similar reservations concerning the traditional approach to stone tool classification have been voiced by researchers (eg. Gould 1971, and Hayden 1977, 1979) involved in ethnoarcheological investigations of modern stone tool using groups. Hayden (1977:179) has described the conflict between what he refers to as his Occidental biases concerning stone tools and their actual operation and treatment within a living adaptive system:

I was certainly not the first to make the observation that stone tools were used in almost an entirely profane manner by Western Desert Aborigines (Gould 1969:81-83; Gould et al. 1971:163), and the idea is perhaps easily accepted intellectually; however it still came as an emotional disappointment to actually see stone tools being used in traditional ways. The feeling of "is that all there is to it?" was uncomfortable. I was unsure of exactly what was missing, but I felt that there ought to be more to using and making stone tools.

He characterized his general observations as a series of surprises. His first surprise concerned the prevailing attitude of Aborigines toward the importance of their tools. "They seemed uninterested in the stone they were using to the point of ignoring it except when the stone no longer was suited for continued use; they were predominantly interested in the work they were doing with the stone, such as making spears" (Hayden 1977). Another surprise Hayden encountered was the general expediency with which stone knapping was approached. In many cases, suitable items were selected from "almost random flakes" in a debris scatter.

The biggest surprise, however, was the rarity of retouched tools produced by the Aborigines:

At first, I saw Aborigines using only unretouched primary flakes for shaving and scraping wood, and unmodified blocks of stone for chopping wood. None of these would have been recognized archeologically as "tools". I wondered if the tradition or knowledge of how to make retouched tools had been lost due to some epi-culture contact phenomenon. That was not the case. Some of the earlier observations on traditional uses of stone tools had described the same lack of retouch (Mountford 1941:316; 1948; Tinsdale 1941; Gould 1969:81-83; Gould et al. 1971:163). . . (Hayden 1977).

After spending time in the field, Hayden saw that retouched tools were actually being produced. However, retouch did not occur as the result of intentional shaping in the production of a specific tool form, but from consideration of the contingencies of any single situation or event. A flake might be retouched to produce a suitable functional edge when other flakes with adequate edges or sizes were not available. In addition, Hayden surmised that the relative availability of raw material could affect the frequency of retouch. In settings where there is a dearth of raw material, the frequency of retouch on stone tools can increase; in situations where raw material is abundant the same task or use could be undertaken with an unretouched primary flake of suitable edge morphology. Of the flakes used as hand-held scrapers Hayden observed that less than 25 percent were secondarily retouched or otherwise modified.

Another factor influencing the occurrence of retouch in the western Desert Aboriginal tool assemblage is hafting. Hayden (1977:180) states:

Obviously, adzes were nearly always retouched, if merely because unhafting and rehafting are time consuming, and once a piece is in the haft it is in self interest to get as much use from it as possible. Nevertheless, hafted adzes are sometimes removed without being retouched, either because of breakage, unsuitability, or poor resharpening potential.

However, out of 51 whole adzes observed in use by Papunya in the Western Desert, Hayden (1979a:12) would have classified 36 as adzes or scrapers, 14 as utilized flakes, two as notched implements, two as backed pieces, and one as a possible truncation (this breakdown totals more than 51 because adzes that could be classified differently by different typologists were counted twice by Hayden). Thus, even in the most formal tool class of the Western Desert Aboriginals, there is a significant amount of morphological variation that could have resulted in two major and three supernumerary classes of artifacts had the Papunya assemblage been analyzed from a traditional archeological perspective.

Hayden concludes that the stone tools of the Western Desert Aboriginals are not the result of predetermined manufacturing specifications, "but rather mechanical results of having to create or sharpen a cutting edge one or more times" (Hayden 1977:182). The condition or stage (e.g., unmodified, single flake removals, single resharpenings, or multiple resharpenings) at which a tool is discarded can be determined by the quality or availability of raw material, the appropriateness of an edge for resharpening, or the completion of the task for which the tool was needed. In other words, much of the modification that occurs on stone tools is related to organizational properties of adaptive systems that are situational in character and which transcend the traditional form-function assumption. Use, in Hayden's experience, is associated with more general and gross morphological attributes such as effective edges whose shapes never strictly conformed to specific style and size criteria.

These discoveries have resulted in the renunciation of most morphological variation as an explanatory, and therefore a classificatory, principle. Dunnell (1971, 1978a, 1978b, 1980a and 1980b) has argued for the avoidance of artifact-centered classifications. Since few constraints were placed on the potential uses of a stone tool or flake, there was no reason to assume that an individual artifact was designed to perform or did perform only a single activity (i.e., cutting, scraping, shaving, shredding, etc.). The multipurpose nature of stone tools can be better understood by organizing analytical procedures around the concept of "use." Each artifact may be broken down into its component parts, analyzing each utilized edge as a separate tool. Tools comprising a single artifact might or might not be functionally integrated in the performance of a complex task (e.g., spear shaft manufacture). By dissecting the artifact into its component parts, and placing the emphasis of analysis on individual "uses," Dunnell pointed out that functional variation (masked by traditional artifact-centered classifications) could be preserved.

Following this line of reasoning Schiffer (1975a and 1979) has adopted a stance even less dependent on stone tool morphology. He states (Dunnell 1979:20):

It seems as though the next step, that of substituting uses for working edges, is an inevitability brought about by (1) greater interest in unifying our behavioral concerns with the analytic instruments-classifications by which we attempt to realize them and (2) the increasingly promising results of experimental use-wear studies, which indicate the prospect of being able to provide the principles needed for inferring precisely the amounts and kinds of uses responsible for the modifications observed on archaeological specimens. . .

Schiffer (1979:20) suggests that classifications oriented toward the concept of "use" can provide the basis for confronting just those kinds of problems discussed by Hayden and others. Use-based classifications can:

1. effectively describe functional variability in expediently manufactured tools which "resist morphofunctional classification."
2. identify and categorize multifunctional and recycled tools.
3. potentially provide a basis for including morphologically dissimilar tools within the same use category.

Although "use" is gaining prominence as the basic organizer of lithic classifications, consideration of morphology still most effectively answers some research questions. Categories of use-based classifications (e.g., meat cutting, hide scraping, bone graving, etc.) hold only a superficial significance, ignoring the technological adaptive responses of subsistence-settlement systems to varying situational demands. Hayden's (1977, 1978, 1979a) observations concerning the effects of Western Desert tools is a good example of these adaptive strategies.

Binford (1977, n.d.) has examined the character of these relationships and contends that the conditional states and associations of artifacts at their loci of disposal contain the answers for explaining prehistoric adaptive organization. In "Forty-seven Trips" (1977), Binford contrasted different disposal behaviors and disposal states of artifacts in curated versus expedient technological systems. Although his major objective was to generate expectations concerning the differences between Upper and Middle Paleolithic assemblages, viewed from another perspective these technologies could as easily represent different conditions within a single technology. For instance, under conditions of low availability of raw material, greater attention should be paid to the maintenance of existing tools and there should be a low rate of discard. In the case of the Nunamiut, such conditions prevailed during extended trips to procure caribou. However, at their base camps most of the constraints placed on gear by scarcity were relaxed and more casual tool treatment and discard was practiced.

Although the notion of use-based classifications appears to provide a firm basis for confronting the kinds of issues raised by Hayden (1977, 1978, 1979a) and others, it tends to ignore attributes that inform on broader scale adaptive organization. The very attributes (e.g., retouch) that were considered spurious in the development of classifications reflective of pure use have meaning when organizational properties of lithic technologies are considered (see Binford 1977, 1978, n.d.). Given these various perspectives on stone tools it is apparent that there is no single "correct" classificatory scheme for lithic assemblages. Classifications, as Hill and Evans (1972) would contend, should be based on the questions being asked of the data. The Haw River analysis and classification system has been designed to incorporate information on both use/action and technological organization. Without the benefit of a controlled microwear analysis, however, the latter aspect must assume the dominant role.

Binford (n.d.:15) defines technological organization in terms of how a group perceives the functioning of their gear in "the planned execution of their adaption." That is, gear is organized according to goal-oriented subsistence decisions which involve anticipating future conditions. The Nunamiut conceive of their gear as belonging to one of three major types: personal gear, site furniture, and situational gear.

Personal gear is that part of the Nunamiut technological system which is generally carried by each individual in anticipation of future conditions or activities. When Nunamiut men plan an expedition away from the village, they organize personal gear to anticipate requirements of the procurement goals of the trip, their comfort along the way (e.g., warmth and food), and the unplanned contingencies which might occur during the expedition (Binford 1977:31). Interviews with Nunamiut men on the traditional composition of personal gear produced the following list: "bone cutters" for slotting antler and bone, "crooked knives," radial or discoidal cores, ice chisels, "axes," flints for fires, "men's cutting board," bow and arrows, quiver, bow case, extra sinew for sewing and making animal snares, needles, extra skin patches, pressure flakers, flake knives and large flakes for butchering (Binford n.d.:16-18). Personal gear was heavily curated (i.e., recycled, reused,

heavily maintained) and was always replenished and in good condition before setting out on an expedition. Binford (n.d.:19) argues that the discard patterns of such gear follow a normal trajectory of use-life and that worn out items are generally discarded within the residential camp in the Nunamiut system, rather than in the field.

Site furniture is also anticipatory in nature, but is generally considered community property. This category of gear is typified by low-use ratios and is generally cached at a location for reuse during subsequent reoccupations. The most common examples of site furniture in the Nunamiut assemblage are hearth stones, hearths, anvils used in pounding bones for broth, Kaotah (used both as hammerstones and large scrapers for removal of peristeam from long bone shafts), tent weights, support sticks, antler racks, worn wooden "meat dishes," old "cooking buckets," lithic raw material, sled runners, firewood and ladles. Site furniture on special purpose sites such as hunting stands is often comprised of a large number of laterally recycled objects such as worn out kettles and other containers like those mentioned above (Binford n.d.:21-22).

Situational gear, as opposed to the other types of gear, is "responsive" in nature. That is, it is used in situations which are unanticipated or where the use of an item of personal gear would be inappropriate. The design of situational gear is constrained only by the available raw material which may be provided from a material cache, modified personal gear, material resources of the immediate environment, or scavenged material of previous occupations. Therefore, situational gear is very expediently designed, quite variable in morphology and directed toward the execution of single activities. These activities are generally unpredictable, but not necessarily "unanticipated" in the most general meaning of the word.

The basic classification for the Haw River lithic assemblage will be structured around these three general categories of gear. Admittedly, the Nunamiut technology, which can be characterized as highly curated, is different from the prehistoric technologies of the Piedmont, but the organizing principles of Binford's scheme should be applicable to any technology. At a basic level, all hunter-gatherer groups must anticipate future conditions while executing subsistence-settlement strategies and must make their technologies responsive to those anticipated conditions. Finally, since Binford's scheme is applicable to such diverse modern groups as the Nunamiut, or the Alyawara of Australia (see Hayden 1979a or Gould 1971) it is not expected that the prehistoric groups of the North Carolina Piedmont would present an exception to these organizational principles.

Personal gear, it will be remembered, consists of tools which are anticipatory in nature, highly curated or conserved and which have narrow design constraints (highly formalized). There are basically only four stone tool types which conform to these requirements: projectile points (and ancillary forms such as "drills") hafted endscrapers, bifaces and flake blanks. The second category consists of the classic "tear drop" or Type I endscraper described by Coe (1964:73-76) and the more variable but finely worked endscrapers associated with Paleo-Indian assemblages (see Wilmsen 1970). The biface is the most variable

category within the items of personal gear. As in the case of the Nunamiut (Binford n.d.:17), there is evidence to suggest that bifaces were serving not only as tools but also as "radial" cores to provide a ready source of raw material in the form of large flake blanks. Information from the raw material caches (Features 22 and 52; see Chapter 7) in Block A of 31Ch29 would suggest that the flake blank was an alternative transportable raw material source.

Site furniture consists of items which are left or cached at site upon abandonment and which are intended to be re-used upon subsequent occupations of the site. The inventory of site furniture from the Haw site group consists of: 1) caches of flake blanks and/or tools, 2) hearth stones, 3) hammerstones, 4) pitted cobbles, 5) anvils, 6) grinding stones and 7) unaltered cobbles of knappable raw material.

Situational gear in the Haw River assemblage is comprised of various flake tools. This category is quite variable in terms of the amount of retouch and probable use. Heeding Hayden's (1977, 1979a) cautions concerning the expedient and heterogeneous nature of these tools, types were formed principally on the basis of size. Thus, the various conditions of edge suitability (edge damage from use/no retouch, single flake retouch, single resharpening, multiple resharpenings) cross-cut types. Unusual forms of retouch such as denticulation, serration or scalloping were considered to represent variability in usage and therefore played an important role in the typology.

A final type of cultural material encountered in the excavations, but not really dealt with in Binford's schemes, is manufacturing debris. This category consists of waste flakes, amorphous chunks of raw material, exhausted cores and core fragments, and biface fragments.

Within organizational types, the lithic assemblage was sub-divided into each of the major classes of artifacts for purposes of analysis. Attributes were selected to reflect the salient features of technological organization: 1) design, 2) planned maintenance or resharpening strategies, 3) repair, 4) breakage patterns, 5) use and 6) reduction staging.

Design relates to those attributes of stone tools which are the consequence of what Deetz (1967) would call "mental templates." This would include the stylistic or cultural-historical characteristics of traditional classifications and the projected functional specifications of tools designed to perform specific actions or uses. Often the same attributes can be used to address both of these aspects of design. For example, observing haft morphology or basal treatment on projectile points is as useful in studying functional usages as it is in defining cultural-historical types. The kinds of design constraints placed on tools, as discussed previously, is a function of the organizational levels within a technology. The design of personal gear is the most formal and consistent of the organizational types since these tools are required to pursue anticipated subsistence goals. Their design constraints, therefore, are very narrow. Depending upon the character of the adaptation these

constraints can be extremely narrow or more general in nature. By contrast, situational gear exhibits very few constraints on design (i.e., Hayden 1979a) because it is responsive to unpredictable situations. Diachronic comparison of design constraints within and between artifact classes can provide a basis for discussing directional change in technological organizations.

Planned maintenance refers to those aspects of technological organization which relate to the planned strategies of tool rejuvenation, principally, resharpening strategies. Again, personal gear should exhibit the most formalized and consistent strategies of maintenance. Goodyear (1979) argues that symmetrical rejuvenation strategies exhibited on Clovis Points, and the highly predictable, siliceous raw materials which were used, prolonged the use-life of this tool in the operation of the highly mobile Paleo-Indian subsistence-settlement system. In another case, Hayden (1979a:12,80) contends that retouch on adzes in the Western Desert technological system is mostly a result of the kind of use to which the tool is put. Since adzes are hafted in their use, retouch is applied to avoid the labor intensive task of rehafting. Whereas the retouch techniques exhibited on Clovis points are characteristically symmetrical and finely applied with a pressure flaker, retouch applied to Australian adzes is rather coarse, accomplished with a hard hammer, and is characteristically irregular. These differences relate to the different functional demands placed on these tools. As the intended uses and design constraints of tools vary, so will the planned maintenance strategies. Comparisons within classes should be useful for discussing changes in the organizational characteristics of technologies through time. For instance, a decrease in retouch symmetry could suggest a relaxation of constraints on the potential uses of a tool. In other words, a trend toward multipurpose application could be traced by monitoring maintenance strategies.

Repair and breakage patterns can inform on several levels of organization. First, the kinds of unrepaired breaks that occur on discarded tools can demonstrate the character of design constraints that are placed on those tools. (These patterns will be most obvious when examining formal tools such as projectile points.) Breaks which would not appear to render a tool inoperable, but which do result in its discard might indicate that this tool operated within a very narrow range of constraints (i.e., the tool is highly specialized). A high incidence of repair modifications to breaks might suggest a more general function. In addition, the types of breaks exhibited within a class can show the structural weaknesses of a tool form given the range of its use applications. In this sense, breakage patterns provide one perspective on the evolution of a particular class of tool through time.

The concept of use has been discussed in some detail earlier in this chapter. A detailed microwear study could not be undertaken within the framework of this project, but certain macroscopic wear characteristics were noted and incorporated into the assemblage analysis. Edge damage in the form of drilling and nibbling was monitored so that tools not exhibiting retouch could be included in the analysis, primarily as situational gear. Following Dunnell's (1971, 1978a, 1978b) suggestions, each edge exhibiting damage and/or retouch was analyzed separately. Reuse or recycling (see Schiffer 1976) of tools was also monitored, as another indication of the level of curation within an assemblage.

Reduction staging refers to strategies of raw material procurement and gear replenishment. These activities usually occur in staged sequences which can be temporally separated. The manufacturing debris found on archeological sites holds clues to the character of reduction strategies and technological organization within adaptive systems. Binford (n.d.) comments that lithic procurement strategies in the Nunamiut, and hunter-gatherer systems in general, are embedded in and subservient to the subsistence goals of the group. In other words, procurement of raw material and replenishment of gear is generally opportunistic and is accomplished during "downtime" as an adjunct to subsistence concerns. This denies the popular view that quarrying is a discrete activity requiring special procurement trips and preparations (e.g., House and Smith 1975). It seems likely that the degree to which quarrying becomes a discrete activity within a subsistence-settlement system should depend on the character of lithic and subsistence resource distributions in particular environments. Environments containing ubiquitous distributions of lithic material would provide many opportunities for material replenishment, and very few accommodations and logistical plans would be required. By contrast, environments with scarce and localized lithic sources would require a more planned procurement strategy, especially if subsistence and lithic resources are widely separated.

The analysis program developed for the Haw River project is composed of sets of attributes which are pertinent to one or more features of technological organization. Design is described in terms of shape and metric dimensions. Planned maintenance involves edge angles, retouch technique, and resharpening ratios. Repair patterns relate to measures of symmetry. Types and locations of breaks are included in breakage pattern concerns. Macroscopic wear patterns, reuse and the metric characteristics of edge damage contribute to the description of use. Finally, reduction staging involves the metric and stage attributes of manufacturing debris.

The attributes are organized by major tool class as described under the headings of personal gear, situational gear and site furniture. Descriptions of the attributes are presented in Appendix 2 along with the laboratory coding sheet forms. Computer lists of the resulting analysis are displayed in Appendix 2 by major tool class. Edge angles were measured with goniometers and metric dimensions were measured with 15 cm calipers. Weights were measured with metric balance beams. All other variable values were recorded by visual inspection.

For purposes of describing the assemblage, most of these attributes will not be summarized or discussed in this chapter. Only those attributes which are useful in making distinctions within the major tool classes (arranged by organizational type) will be considered. The synthetic chapters dealing with assemblage evolution (Chapter 13) and the spatial analysis of occupation floors (Chapter 12) will incorporate the mass of this information by discussing it within the conceptual framework of technological organization (i.e., design, planned maintenance, repair, breakage, use and reduction staging).

CERAMIC CLASSIFICATION AND ANALYSIS PROCEDURES

This section reports on ceramic artifacts identified during archeological investigations at the B. Everett Jordan Reservoir. These fragments of aboriginal pottery were recovered in 1979 from excavation context at sites 31Ch8 and 31Ch29. Principal concerns are: 1) to examine and describe information expressed by these pottery sherds, and 2) to incorporate that information into contemporary models of North Carolina prehistory. An analytic strategy addressing these two goals consists of: 1) a detailed consideration of technological variables, and 2) the use of descriptive multivariate statistics. Synthesis of these data suggests a resolution of debates about prehistoric pottery in the Reservoir region (Chapter 10).

Previous research in the Reservoir area by Smith (1965a), McCormick (1970), and Wilson (1976) has led to alternative models of prehistoric ceramic chronology. Differences in these models pertain primarily to the New Hope pottery series — a ceramic type first defined by Smith (1965:107-117). Smith (1965a:154-155) estimates a date "... on the order of 1000 to 1200 A.D.," although "... this proposed date may have to be revised to an earlier time level." McCormick (1970:84) suggests that "the New Hope series probably dates to around A.D. 500." Wilson (1976: 37,40), on the other hand, argues later proto-historic dates for the series. The data and analysis presented herein propose that the New Hope Series issue may be perceived as a definitional problem; clarification of this issue is a specific objective of the present investigations.

The analytic classifications established by this study agree with recognized models of Piedmont pottery, as well as with excavated data from the Haw River sites. These categories indicate temporal themes of prehistoric pottery manufacture, such as increased sophistication in the selection and use of clays. It is also possible to posit the presence of a sandy, friable ceramic for the Late Archaic/Woodland transitional period; we have designated this pottery "Haw River."

Background and Context for Classifications

The period of Piedmont North Carolina prehistory relevant to discussion of Haw River ceramics spans almost 3000 years, from 1000 B.C. to historic colonial times at A.D. 1700-1750. These 3000 years witness several significant cultural events and processes. As indicated by studies at the Research Laboratories of Anthropology, University of North Carolina, Chapel Hill, these cultural dynamics include: the first appearance of ceramic vessels (Coe 1964:55); the adoption of bow-and-arrow technology (Coe 1964:119); the development of a more fully agricultural economy (Coe 1964:51); and increased sedentariness among human populations. This sedentary trend led to permanent villages frequently located along riverine floodplains (Coe and Wilson 1975:68). Population growth during this time period also appears correlated with a greater intensity of inter-regional interaction. The intrusion into Piedmont North Carolina around A.D. 1500 of Mississippian populations from the south is marked evidence of this interaction (Coe 1952:308). A final

series of cultural interactions occur with the arrival of colonial European settlers, subsequent demise of indigenous aboriginal societies is rapid.

Figures 4.4, 4.5 and 4.6 provide an outline for study and interpretation of the ceramic period in the Reservoir area. The literature references cited in Figures 4.4 and 4.5 contain detailed information, including specific dates. The units of Piedmont prehistory shown in Figures 4.4 and 4.5 denote analytic relationships among extensive artifactual data. Temporal trends of aboriginal behavior derived from these data are summarized below. Two monographs by J.L. Coe, *The Cultural Sequence of the Carolina Piedmont* (1952) and *The Formative Cultures of the Carolina Piedmont* (1964), are the primary references. A detailed description of one data set — pottery from the Haw River sites — follows this narrative.

The archeological record indicates a pattern of relative cultural stability for societies adapting to the Piedmont environs during the 6000 year Archaic period, (See Chapter 3). These years of efficient hunting and gathering economies nevertheless witnessed gradual population growth and elaboration in material culture. Increased sedentariness among Late Archaic groups is evident at the Gaston site in the northeast Piedmont. However, these groups are thought to have continued seasonal patterns of subsistence activities. Typical artifacts appearing during the Late Archaic include steatite/soapstone vessels, full-grooved axes, polished stone atlatl weights, and large, often crudely made, projectile points.

A series of major excavations in the Piedmont have failed to document an *in situ* development for the Early Woodland cultures. Coe (1952:303) briefly discusses steatite tempered clay in the northern Piedmont as an indication of Late Archaic/Woodland transition, but the period from 500 B.C. to 1 A.D. is more commonly perceived as a discontinuity or hiatus. These terms attempt to convey the idea of an abrupt change in artifact inventory occurring in stratigraphically adjacent Late Archaic and Early Woodland deposits. The Early Woodland inventory, as defined by the Badin artifact assemblage at the Doerschuk Site on the Yadkin River, contains large, crude triangular point forms and earthenware vessels. Of particular note is the quality of the Badin vessels; the hardness and compactness of the fired clay suggested that the techniques of pottery manufacture had developed earlier and/or elsewhere. An assessment of triangular point technology supports this hypothesis (Coe 1964).

Yadkin and Vincent artifact assemblages define the next Woodland period. The Yadkin component at Doerschuk is essentially a continuation of Early Woodland themes. Several new design elements appeared on pottery vessels and the triangular projectile points were better made. The contemporary Vincent component at the Gaston Site provides further artifactual data from this period. House structures are arranged in small compact villages. Skeletal remains of dogs in food refuse pits afford insight into dietary habits. Perhaps most relevant for this study are the similarities between Yadkin and Vincent ceramics.

Qualitative changes in subsistence activities occurred during the Uwharrie period. Agriculture, poorly defined in Carolina Piedmont before A.D. 1000, emerged as an important economic consideration by A.D. 1200. Hunting of deer and other small mammals

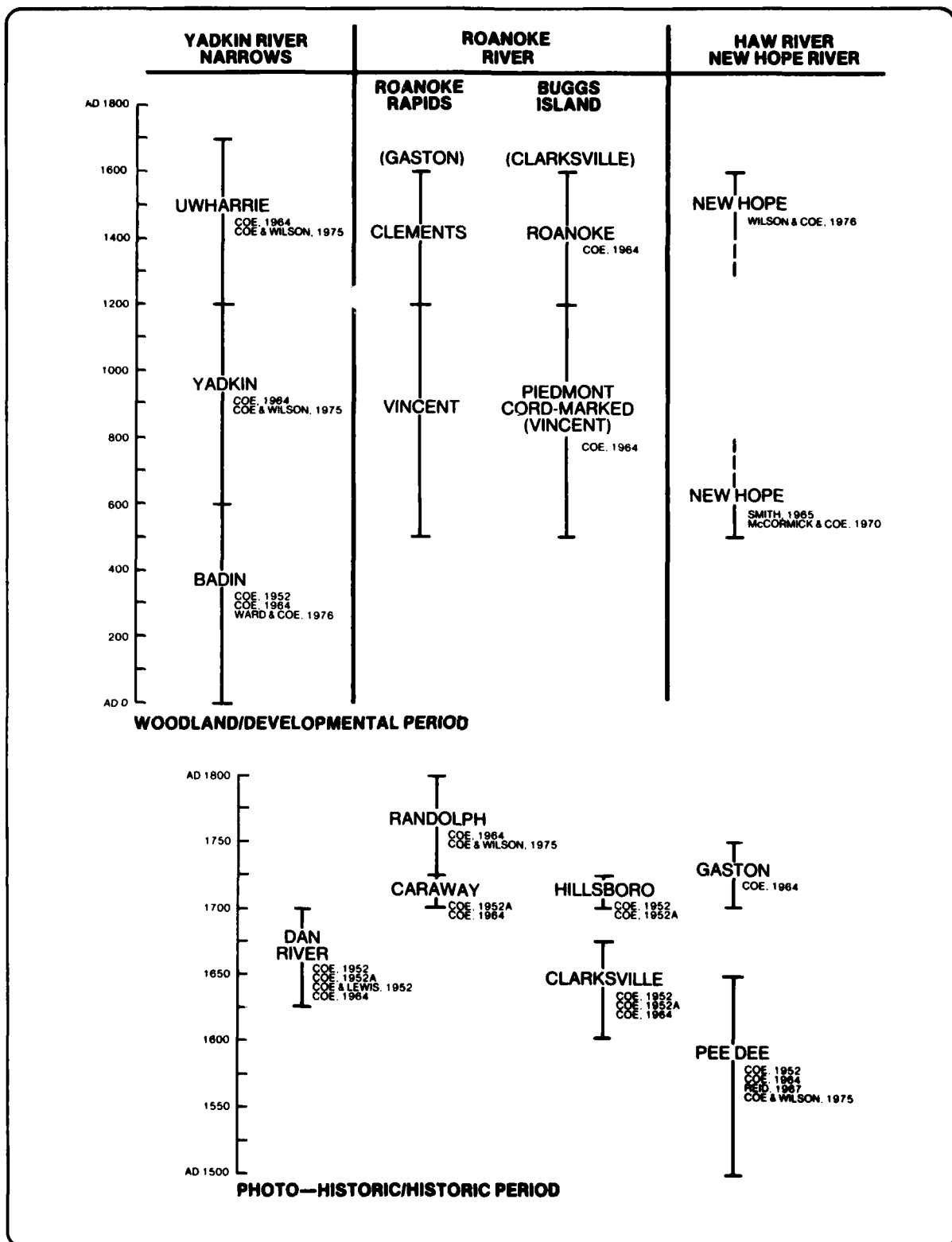
remained a primary procurement strategy, however. At the Gaston Site, charred hickory nuts are abundant, and evidence suggests that the dog retained its status as a food item. Villages of circular houses adjoined cleared agricultural fields along the alluvial floodplains of major rivers. The Uwharrie period has been identified as the "...parent culture out of which the later ones emerged, specialized, and diverged" (Coe 1952:307). Rapid population growth occurred during the Uwharrie period and resulted in the expansion of Uwharrie populations to the north and south. A homogeneous ceramic repertoire accompanied this expansion. The eastern Siouan Indians of Piedmont North Carolina were the historic descendants of these broadly based Uwharrie populations.

The population dynamics of proto-historic and historic times may be examined against the backdrop of Uwharrie society. Where Uwharrie settlement units remained relatively unaffected by these concerns, the archeological record produces minor variants of Uwharrie artifacts. In other areas of the Piedmont, however, new artifact and settlement types appear. Foremost among late prehistoric events was the intrusion of Muskogean-speaking Indians into the southern Piedmont (Ferguson 1967). These fully agricultural societies lived in large palisaded villages, fortified in response to the constant warfare which characterized this period. Known archeologically as the Pee Dee, this group of people erected public buildings on conspicuous earthen mounds. Distinctive ceramics associated with Pee Dee occupations appear as far west as the Appalachian Summit (Keel 1976:180-181). Pee Dee influence in the Piedmont ended rather abruptly about A.D. 1650.

Several distinct cultures provide comparative data for the proto-historic and historic periods of the North Carolina Piedmont. For each of these groups, historical documents supplement archeological data. The archeological designation for the Sara Indians living along the Dan River in the northwestern Piedmont around mid-17th century is simply "Dan River." These people resided in small palisaded villages, grew a variety of agricultural crops, but relied primarily on hunting and fishing for subsistence. This pattern of life was similar to that of the earlier Uwharrie groups. The presence of Pee Dee pottery sherds at Dan River sites, as well as the presence of ceramic styles characteristic of the Roanoke River Basin area indicate extensive regional interaction.

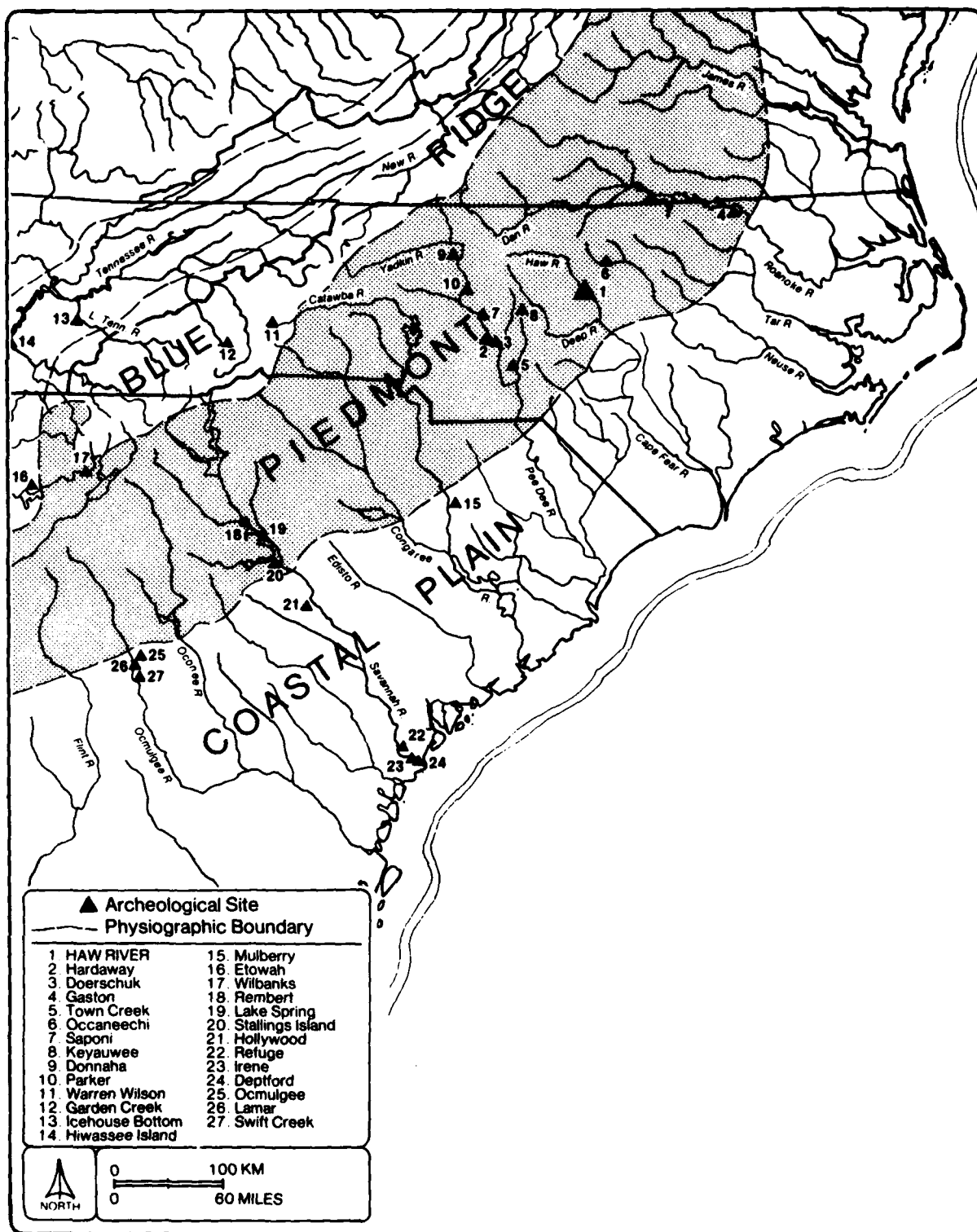
In the southern section of the Piedmont, archeological investigations have identified the early eighteenth century Indian village of Keyauwee. Data from this site in Randolph County document the lineal relationship between the prehistoric Uwharrie complex and historic Siouan tribes. The historic Caraway component of the site demonstrates a continuation of artifact patterns expressed throughout Badin, Yadkin, Uwharrie, and Dan River times.

The Hillsboro (Hillsborough) archeological complex of the Roanoke Rapids area in the northeast Piedmont can be attributed to the Occaneechi, an historic Siouan group. Small palisaded villages of circular huts housed these Indians around A.D. 1700. The essentially aboriginal character of Hillsboro culture is further seen in the retention of bow-and-arrow technology and exclusive use of ceramic vessels. The Clarksville archeological assemblage in the same area precedes the Hillsboro Occaneechi by less than forty years.



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA
 COMMONWEALTH ASSOCIATES, INC.

FIGURE 4.5
ARCHEOLOGICAL DESIGNATION



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA
 COMMONWEALTH ASSOCIATES, INC.

FIGURE 4.6
SELECTED
ARCHEOLOGICAL SITES &
PHYSIOGRAPHIC BOUNDARIES-
SOUTHEASTERN UNITED STATES

A third historic archeological complex also appears in the Roanoke River drainage. Artifacts of the Gaston component at the Gaston Site contrast markedly with the preceding *in situ* Vincent-Clements development. Of particular interest is the hint of changing environmental conditions from Vincent to Gaston times. The replacement of spotted skunk by striped skunk, and fox squirrel by gray squirrel in the archeological record may indicate a cooler, drier climatic regime.

A final component of the archeological record represents the rapid decline and decimation of indigenous societies after contact with European settlers, European diseases, and European weaponry. The disruption of aboriginal social structure and economies by 1727 forced the creation of ethnically heterogeneous small groups of Indians which existed until about 1800.

Several discrete sets of artifacts emerge in the archeological record as a function of these events in prehistory. Fragments of aboriginal ceramic vessels comprise one such artifact set. Research by students of Piedmont North Carolina prehistory has established several subdivisions within this set. The pottery categories most relevant to analysis of Haw River ceramics are as follows:

Badin — References: Coe 1964:27-29. Defined from excavation data at the Doerschuk Site, this pottery was made from a well-kneaded paste containing very fine river sand. Generally fired in an oxidizing environment, Badin vessels are of a hard, sandy-textured, compact fabric which frequently fractures across coil lines. The exterior of these vessels was most often impressed with large, clear, over stamped cord markings or wicker-type fabric markings. Varieties of plain and net-impressed vessels are tentatively defined. The interiors have been carefully smoothed, and have a clayey feel. Vessel radius is 10-14 cm; wall thickness ranges from .5 cm to 1 cm and averages .8-.9 cm. Badin vessels have generally straight vertical rims and thinned, rounded lips. Smoothing of vessel lips produced an undulating form.

Yadkin — References: Coe 1964:30-32. This pottery occurs stratigraphically above Badin pottery at the Doerschuk site. The paste of Yadkin vessels and sherds contains as much as 30-40 percent crushed quartz inclusions. The paste, although compact and well-kneaded, is coarse and friable. Firing of these vessels appears more variable and less thorough than that of the earlier Badin sherds; however, fractures frequently traverse coil lines. Small cord markings which were partially smoothed after application and fine fabric impressions are typical surfaces on Yadkin vessels. Linear checked stamp designs also occur. Vessel radius (n=1) is 16 cm; wall thickness ranges from .4 to .8 cm on cord marked vessels, averaging .6 cm., and from .5 cm to 1.2 cm, averaging .8 to 1.0 cm on fabric impressed vessels. The rims are straight and vertical. Lips are generally round and smooth; fabric marked vessels often have flattened rims and fabric impressions on the inside of the rim. An examination of type specimens through the courtesy of Joffre L. Coe also indicates that Yadkin sherds are not especially dense, although a range of density was noted.

Vincent — References: Coe 1964:101-102. In the Roanoke Rapids area of the North Carolina/Virginia border, Vincent ceramics parallel Yadkin sherds temporally and stylistically. Vincent sherds contain significant proportions of very fine river sand which gives the pottery a gritty, sandy (but not granular) texture. The paste, well-kneaded into a compact, non-porous fabric, was fired in an oxidizing atmosphere. Sherds from these vessels are fairly hard. Exterior surface treatment is limited to clear overlapping cord impressions and wicker-type fabric impressions. The interiors of Vincent vessels were smoothed without tooling to produce a floated surface. Vessel radius is 12 to 15 cm for bowls and 24 cm for jars. Wall thickness ranges from 5 mm to 10 mm, averaging 8 mm. Lips are generally straight and rounded and rims are irregular and finger-smoothed. Some rims of cord-marked vessels are also impressed on the interior.

Uwharrie — References: Coe 1952:309-308; McCormick 1970; Wilson 1976. The distinguishing characteristic of Uwharrie vessels is the exclusive presence of crushed quartz inclusions, some as large as vessel wall thickness. Uwharrie sherds recovered from previous research in the B. Everett Jordan Reservoir were noted to be unusually or highly friable. The exterior of Uwharrie vessels exhibits a variety of surface treatments including cord markings, impressions of a heavy loose-weave net, and scraping. No wicker fabric impressions occur. Investigations by McCormick and Wilson at the Haw River sites also have produced plain, simple stamped, and check stamped Uwharrie sherds. The first appearance of incised line decorations, usually on the short vertical rims, occurs on Uwharrie vessels. Vessel interiors were scraped and thinned with a serrated-edge tool. McCormick reports a radius of 10 cm for Uwharrie vessels, and a wall-thickness averaging 8 mm. Examination of type specimens at the Research Laboratories of Anthropology, UNC — Chapel Hill, indicates a dense, fine-grained paste, which was not necessarily well mixed.

Clements and Roanoke — References: Coe 1964:100, 102-105. Contemporaneous with Uwharrie pottery, Clements vessels from the Gaston Site were manufactured with a paste containing large quantities of river sand, ranging in size from medium fine to coarse. A high percentage of very fine mica in a compact, sandy paste is another diagnostic feature. Clements sherds have a granular texture and sugary appearance. Vessels were well-made; fractures usually extend across coil lines. The radius of Clements vessels ranges from .4 cm to .8 cm, averaging .6 cm, and they are thinner than the earlier Vincent sherds. Exterior surfaces exhibit tighter and finer cord impressions and smaller wicker-fabric markings than comparable Vincent specimens. Interiors of Clements vessels were scraped and tooled smooth. Rims on Clements vessels are generally straight to slightly flaring; the straight lips are often flattened, and some notching occurs. A ceramic series designated "Roanoke" occurs some forty miles up-river from the Gaston site. Attributes of Roanoke sherds parallel those appearing on Clements sherds; cord and fabric markings, sand inclusions, and a sugary appearance in cross-section are particularly notable characteristics of Roanoke pottery.

Pee Dee — References: Coe 1952:308-309; Reid 1967:42-54; Coe 1964:32. The paste of Pee Dee vessels contains usually large quantities of fine river sand and occasional granules of metamorphic rock. Thoroughly mixed and well-fired, this paste produced vessels which have

a granular (ranging to coarse) texture and distinctive sugary appearance. Three surface treatments predominate on Pee Dee vessels: complicated stamped motifs, smoothing, and textile wrapping impressions. Complicated stamped designs occur principally on large burial urns. Deep hemispherical bowls which functioned as urn covers and the distinctive cazuela bowls exhibit plain surfaces. The type of smoothing and burnishing of plain vessels ranged from crude tooling to almost reflective polishing. Nodes of punctations and zones of incising occur around the rims of the cazuela bowls. The interiors of Pee Dee vessels are also smoothed or burnished. Thickness of Pee Dee sherds range from 7-12 mm for the large urns, and from 5-10 mm for the various plain bowls.

Clarksville — References: Coe 1964:100. Bowls and jars comprising the Clarksville ceramic category show primarily net-roughened surfaces. Cord markings occur rarely, and wicker-type fabric impressions not at all. A small percentage of Clarksville vessels display surface treatments which appeared in greater frequency two decades later: smoothing, scraping, and stamping with either a simple or check design. The rims of Clarksville jars flare, and are often thickened. Incising, punctuation, and occasional notching decorate vessels lips.

Dan River — References: Coe 1952:309-310; Coe and Lewis 1952. In Dan River vessels, coarse river sand partially replaces the crushed quartz inclusions of earlier Uwharrie vessels. The compact paste was rough and gritty when fired. A net-impressed surface finish occurs on most Dan River vessels. Plain surfaces also occur with some regularity. Minor surface treatment styles include corncob impressions, cord marking, scraping or brushing, and rarely, complicated stamping. Vessel interiors were carefully smoothed. Jars exhibit outwardly flaring rims, while rims on bowls are straight or slightly inverted. Patterns of punctations and incising occur on the neck. Lips are either flattened or rounded, and are decorated with notching or incising. Vessel wall thickness ranges from 4-13 mm, averaging 8 mm.

Caraway — References: Coe and Lewis 1952; Coe 1964:33-34. Caraway vessels were made from a paste containing very fine particles of sand and fired to produce a very hard fabric. Caraway ceramics have been termed the best of all aboriginal pottery of the southern Piedmont ceramic tradition; sherds from these vessels emit a pronounced ring when tapped against a hard surface. Many Caraway vessels were smoothed and burnished on the exterior, although the quality of burnishing does not equal that appearing on other later historic pottery (e.g., historic Catawba ceramics). Complicated and simple stamping also occur along with a few examples of corncob and net impressions.

Gaston — References: Coe 1964:100-101, 104-106. Gaston sherds contain crushed quartz inclusions and a high percentage of fine gold-colored mica. No river sand occurs in the paste, which is porous, granular, and rough, and has a conglomerate appearance. Clay bonding was good, with fractures generally crossing coil lines. The majority of the vessels were fired in a reducing atmosphere. Vessel exteriors are primarily simple stamped, usually with a parallel groove design. Some vessels show corncob impressions; net impressed vessels are rare. A greater percentage of Gaston vessels have smoothed exteriors than do earlier

Clarksville vessels. The interiors of Gaston vessels were smoothed first with a serrated tool and then by hand. Vessel radius ranges from 15 to 26 cm, averaging 17.5 cm. The thin walls of Gaston ceramics are only 4 to 7 mm thick. Gaston pottery was the only pottery found in the Roanoke Rapids Basin possessing decorated rims. Rims on Gaston vessels are often folded, while vessel necks display incising, punctations, and pinching. Lips are generally flattened and notched.

Hillsboro — Reference: Coe 1952:311. Hillsboro ceramics contain only fine sand as inclusions in the paste. Many vessels are smoothed on the exterior. Simple or check stamping also appears on Hillsboro pottery. Net-impressed vessels are notably absent from the Hillsboro ceramic assemblage. Cazuela bowl forms appear, often with incised neck zones. Hillsboro vessel rims were no longer folded, and notching is absent from rims, although it still occurs on lips.

New Hope — References: Smith 1965:107-118; McCormick 1970:79-81; Wilson 1976:31-41. The New Hope pottery series was defined by Smith in his analysis of Jordan Reservoir ceramic artifacts collected in 1964. Of 372 specimens recovered from surface collections at over 150 sites, 303 were assigned to the New Hope series. Two hundred fourteen (214) of these sherds could be sub-typed within the series. According to Smith, a key to definition of the New Hope series is temper, which is finely crushed feldspar. Larger pieces of crushed quartz also appear, as does fine to medium-fine water-worn sand. The latter tempering agent is present in all New Hope specimens. Smith further notes that the percentages of sand and crushed stone are interchangeably complementary. Temper comprises 10 percent to 30 percent of the paste in most New Hope types; the paste of one variety, New Hope Rough Plain, contains 30 percent to 60 percent temper.

McCormick, in his analysis of pottery recovered during 1969 excavations of Jordan Reservoir sites 31Ch28, 31Ch29, and 31Ch33, reports 2546 ceramic artifacts, of which 1219 or 48 percent are classified as New Hope. McCormick describes the temper of New Hope sherds as fine to medium crushed felsite, which comprises 10 percent to 40 percent of the paste. Most sherds also contain fine micaceous sand and a few small pieces of water-worn quartz. Repeated reference by McCormick to crushed felsite (pp. 72, 80, 84) as opposed to feldspar is probably an error in transcription. Wilson's later analysis of Jordan Reservoir ceramics, for example, refers to crushed feldspar temper in New Hope sherds.

The term "felsite" is properly used as a generic field term applying to all light-colored, microscopically fine-grained igneous rocks. The texture is known as felsitic (Pough 1960:15). Rhyolites common to the Carolina Slate Belt are prime examples of felsic rocks (Stuckey 1965:96). Porphyritic examples of rhyolite contain the minerals plagioclase and orthoclase, which are representative of the feldspar mineral group.

Feldspars are the principal constituents of most igneous and metamorphic rocks, and occur abundantly in many sediments (Ernst 1969:85-86; Pough 1960:235). Of particular interest is the feldspathic sediment called graywacke, a matrix of clay minerals containing

abundant plagioclase grains (Ernst 1969). An outcrop a mile in length which strongly resembles graywacke appears west of the intersection of Highway 64 and Haw River (Stuckey 1965:98), an area only a few kilometers north of 31Ch8 and 31Ch29. Although it is unnecessary as well as analytically taxing to attribute the feldspar granules in Haw River silts and sands to this outcrop, this material readily illustrates the local availability of feldspar for inclusion in Haw River ceramic artifacts.

It is also appropriate to note that the major commercial uses of feldspars are in the ceramic industries. In pottery manufacture, feldspars (preferably albite because of its lower fusibility (Ries 1937 as quoted in Stuckey 1965:383)) are used in both the body fabric and in the glaze. A detailed summary of feldspar atomic structure and chemical composition may be found in Ernst (1965).

Smith and McCormick term the texture of New Hope sherds granular; Wilson uses the term sugary. The generally oxidized New Hope paste is fairly hard, with the exception of the softer, quite friable New Hope Rough Plain. McCormick notes the general absence of large body sherds.

Smith distinguishes six categories of New Hope ceramics: 1) Smooth Plain, 2) Rough Plain, 3) Cord-Marked, 4) Fine-Fabric Marked, 5) Coarse-Fabric Marked, and 6) Net-Imprinted. McCormick defined a second variant of New Hope Net-Imprinted — open weave — and, based on one sherd, the category New Hope Simple Stamped. In the third study of New Hope ceramics, Wilson identified eight brushed sherds as New Hope.

Preparation of the interiors of New Hope vessels ranged from rough smoothing, limited use of a serrated scraping tool, to floated. The diameter of New Hope vessels varies, as in other series; diameters of 16 cm to 40 cm are reported. Wall thickness ranges from 5 mm to 10 mm. Vessel size data presented by Smith suggest that the plain wares were somewhat smaller vessels. The majority of lips on New Hope vessels are finger-smoothed and rounded, while some are flattened. Rims are predominantly straight and vertical, or slightly everted.

A terminological problem exists as well with Smith's ceramic classifications. By his own definition (Smith 1965b:107):

series...refers to a grouping of sherds sharing common temper, paste characteristics, and various general rim, form and manufacturing techniques. The member types are present in comparatively large numbers and are considered to be closely related. Use of the term, series, is not intended necessarily to mean a greatly restricted time span, but does mean that the member types are believed to be more or less contemporaneous.

to continue, he further defines ware (Smith 1965b:107-108) as:

groupings of specimens sharing a common temper. No relationship beyond this is intended for the included groups by this treatment...The various member groups of a ware are too poorly represented to allow adequate comparison with the recognized types of the area, or even to set up types with any hope of giving an adequate description of the material involved.

Following those definitions, it would seem that the New Hope materials would be better described as a *ware*, since the inclusion of feldspar temper seems to be the single common element of his New Hope types. Illustrated and described varieties of New Hope ceramics include smooth plain, rough plain, fine fabric-marked, coarse fabric-marked and untyped, which exhibit several variations in paste, color, rim, form, etc. (Smith 1965b; 109-118, Plates XIII-XVI). According to his proffered definitions, *ware* would be the more appropriate identifier for those sherds, since few other elements are held in common, nor were "large numbers" available for analysis purposes. Temporal placement for New Hope ceramics remained a moot question for at least three reasons: 1) no stratigraphic sequences were available to establish relative chronological placement; 2) no absolute dates could be applied to even the use of feldspar tempering as a defining attribute; and 3) specimens of the series, or ware, could as easily be "typed" within existing frameworks which range from Early to Late Woodland, except for the feldspar tempering.

Despite the tenuous data base, Smith carried the idea even further, concluding that:

the Woodland component of the Basin represents at least one previously undescribed *complex* [italics ours] extending to the northeast along the fall zone into Virginia and to the southwest along the fall zone at least to the southeastern edge of Chatham County, North Carolina. (1965b:2)

The idea of a New Hope series (or ware) was reaffirmed in McCormick's thesis. The sherd sample available to McCormick was subgrouped according to conventional attributes of ceramic analysis: temper, surface treatment, color, thickness, etc. Subgroups thus defined were termed "series" and were argued to demonstrate internal consistencies of "attribute clusters" (1970:79). The concept of "cluster" as used by McCormick had no statistically demonstrated significance.

Wilson, like Smith and McCormick, recognized New Hope sherds mainly the basis of feldspar tempering. However, whereas Smith and McCormick attempted to place New Hope ceramics intermediate between Badin (sand-) and Uwharrie (quartz-tempered) series, Wilson diverged from that line of reasoning. Wilson emphasized surface treatment as a chronologically sensitive variable. A majority of the New Hope sherds from the 1974 excavation lacked any surface treatment other than smoothing (plain), a trend also documented by McCormick (88 percent plain) (1970:Figure 26). This attribute was felt to indicate Late Developmental themes. Further evidence for this temporal assignment was a single New Hope simple-stamped sherd with a "sugary" texture which Wilson likens to the Mississippian Pee Dee ceramic series from the southern Piedmont (Wilson 1976:37; Reid 1967).

Analytic Procedures

The analytic concerns of this study are designed to address the variability expressed in the Woodland ceramics recovered from the Haw River excavations; to capture that variation in a manner meaningful and useful to archeological interpretation and synthesis, and, in particular, to use this information for resolution of New Hope pottery series temporal placement. Two components define the analytical strategy addressing these goals: 1) technological analysis and 2) statistical analysis. These two approaches provide a means for examining the characteristics of Haw River ceramic artifacts and for establishing patterns of temporally co-varying traits. Specific methods and results of these research procedures are presented and discussed in Chapter 10, Description and Analysis of Ceramic Assemblages.

Technological Analysis

Examination of Haw River ceramics from a technological perspective had four general purposes:

- (1) To arrive at a general categorization of Haw River ceramics based on easily discernible physical features which reflect in part the technological processes and materials employed in pottery manufacture. The particular expression of these features is the result of their chance or patterned combination in pottery production. Clues to the history and context of pottery production should be contained in the pottery itself. Information derived from ethnographic analogy, ceramic science, and the archeological record is the basis of pottery classification with respect to technological process.
- (2) To produce, in addition to the descriptive technological characterization, categories which are sensitive to chronology, function, and/or cultural groupings.
- (3) To control for information redundancy in the selection of variables used in subsequent multivariate statistical analysis.
- (4) To discover or suggest additional technological variables relevant to the statistical analysis.

In order to achieve these goals, several steps were undertaken. These steps include (1) familiarization with Piedmont and Haw River ceramic variability, (2) field inspection and acquisition of clay samples, (3) preliminary sorting of Haw River site sherds, (4) examination of sherds using a low-power hand lens, (5) detailed examination of selected sherds with a binocular microscope, and (6) definition of technological types.

Familiarization with Piedmont and Haw River prehistoric pottery began with the study and synthesis of appropriate literature (see above). This information was augmented by a visit to the Research Laboratories of Anthropology at UNC-Chapel Hill, made with the

kind permission of Joffre L. Coe. This visit afforded an opportunity to view comparative material and photograph items of interest. Experience with the materials in the collections emphasizes the range of variation in color, texture, "temper", and other technological features possibly appearing within one pot. This variation argues for caution in distinguishing specific types on the basis of highly variable technological factors. Variation within one pot may be deliberate or may result from accidents of firing, clay preparation, inclusion of non-plastic materials.

Field inspection of clay resources in the B. Everett Jordan Reservoir was limited to an area adjacent to sites 31Ch8 and 31Ch29. Examination of Chatham County soil maps (e.g. Jurney, Miller, and Bacon 1937) indicated the representativeness of this area. Samples of both the local primary (residual) and secondary (alluvial) clays were collected from several deposits. A total of nine samples were collected from three basic localities — the banks of the Haw River, a low knoll in the floodplain, and high ground above the floodplain — and are described below. The sample of clays collected seems to give a fair representation of the variety of local clays and almost certainly includes the clays used in the manufacture of the Haw River pottery. The general appearance of the clays, their color range, and the nature of the non-plastic inclusions suggest that several or all of them may have been used in the manufacture of the pottery sample examined. Both primary and secondary clays may have been used alone or in combination to produce all the Haw River pottery examined. Hand-made nineteenth century brick samples collected from the collapsed foundations of Moore's Bridge north of the sites confirm the use of local clays in a variety of ceramics throughout local history. (Moore's Bridge has since been destroyed by the U.S. Army Corps of Engineers during Jordan Reservoir construction). Crushed quartz fragments collected from the bank of the Haw River are of the type present in the local pottery and were evidently available to aboriginal potters. Sand and other rock fragments are conveniently sorted by size during water transport.

The precise sourcing of the clays used in the pottery considered here is difficult or impossible in the absence of a careful microscopic characterization of the clays and a more complete set of firing tests to reproduce the range of firing conditions and possible end products. However, it is apparent, even on a preliminary examination of the pottery and local clays, that the variety of pottery found in the archeological record could have been produced with local clays. It seems unnecessary and mistaken, given the abundance and quality of available clays, and the simple level of organization of pottery production during most of the North Carolina prehistoric period, to posit the use of imported clays. Local clays would have been entirely adequate to produce the range of prehistoric pottery.

Several terms used in this technological analysis have restricted definitions in ceramic and soil sciences. In order to avoid ambiguity in an analysis of clay samples and their relationships to Haw River pottery, these terms are presented below. Sources such as Shepard (1968) and *Soil Taxonomy* (U.S.D.A. 1975) provide detailed discussions of correct usage for specific descriptive terms. This report adheres c'osely to these definitions.

Coring — The presence of a black zone or core in a sherd profile, due to the presence of carbon or reduced iron compounds.

Fabric — The material of pottery, including clay and inclusions.

Friable — Possessing low bonding strength; with reference to clays: when moist, crushes easily under gentle pressure between thumb and forefinger, and can be pressed together into a lump.

Non-plastic Inclusion — A particle in a clay body distinguished from the matrix by its lack of clay (plastic) properties.

Oxidizing Atmosphere — A firing atmosphere that contains free oxygen and promotes oxidation of clay substances, principally carbonaceous matter and iron compounds.

Paste — The clay-water mixture used in the formation of pottery.

Plastic — With reference to clays: when wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Porosity — The percentage volume of pores.

Primary Clay — A clay derived from the parent igneous rock and in the same position as the parent material; similar to but more narrowly defined than "residual" clay which indicates material derived from sedimentary rocks.

Reducing Atmosphere — A firing atmosphere containing no free oxygen, thus encouraging the removal of oxygen from iron compounds to yield iron oxides in a lower state of oxidation.

Secondary Clay — A clay which has been transported from the location of its parent material by wind or water action.

Temper — Inclusions deliberately added to a clay to "temper" the resulting pottery by improving its mechanical and thermal properties.

Texture — A property of ceramics determined by particle size, shape, grading and arrangement.

Vitrification — The formation of glass in a ceramic body.

Of particular import are the following geological terms; definitions are adapted from U.S.D.A. soil manuals (e.g., U.S.D.A. 1959; U.S.D.A. 1960).

Sand — Individual rock or mineral fragments in the soil that range in diameter from .05 to 2.0 mm. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt — Individual mineral particles in a soil that range in diameter from the upper limit of clay (.002 mm) to the lower limit of very fine sand (.05 mm). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Clay — As a soil classification, the mineral soil particles less than .002 mm in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

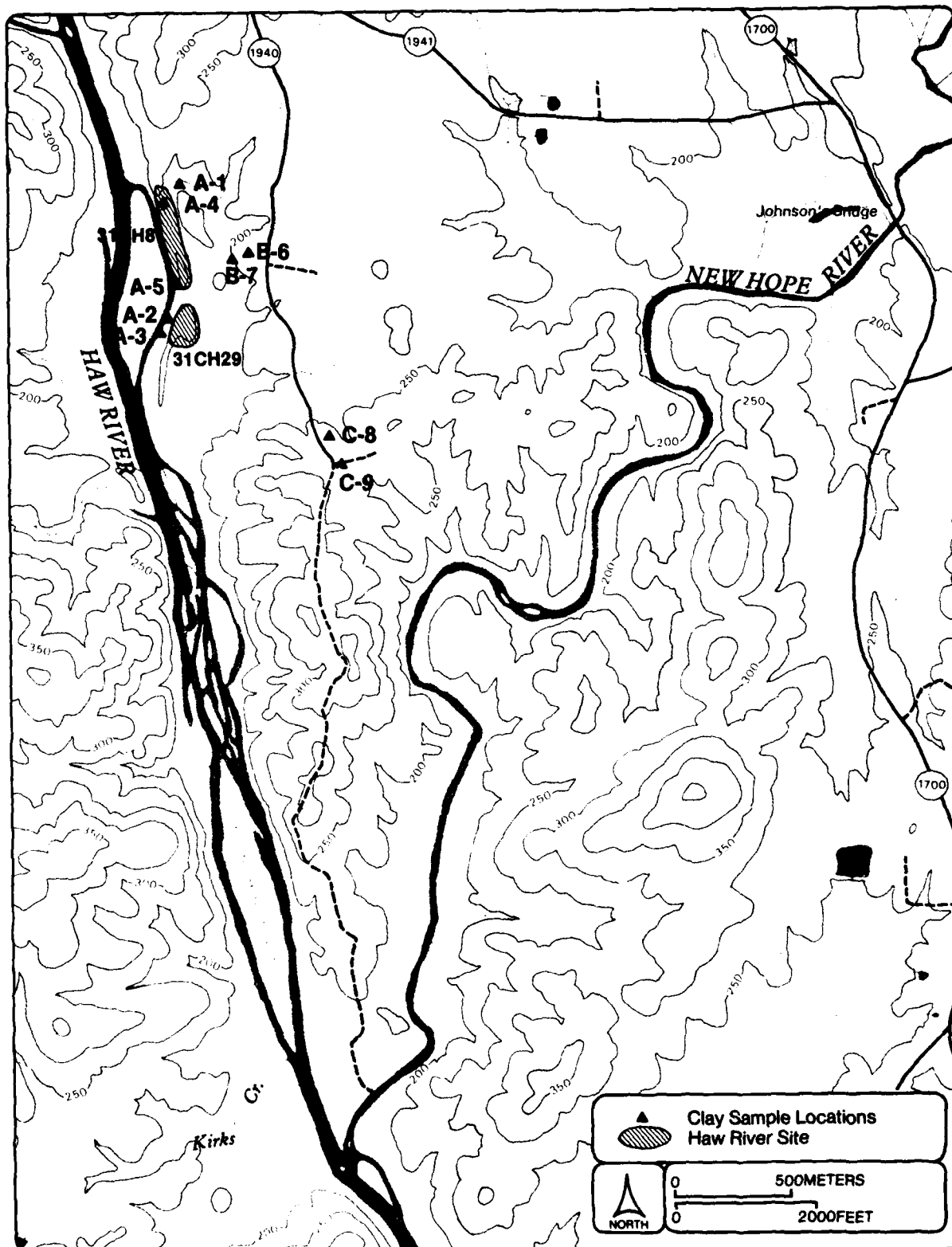
The relative proportions of sand, silt, and clay particles in a mass of soil determine texture. The basic textural classes, in order of increasing proportion of fine particles are sand, loamy sand, sandy loam, loam, sandy clay, silty clay, and clay. Three of these categories — sand, loamy sand, and sandy loam — are subdivided into coarse, fine, and very fine.

The clay or soil samples collected and examined from the Haw River area fall into three basic categories:

- (A) Secondary clays from flood deposits near the present stream channel;
- (B) Secondary clays from nearby low knolls representing older alluvial action; and
- (C) Primary clays from the upland hills above the floodplain.

Included in category (A) are Congaree silt loam (C1), Congaree fine sandy loam (Co), and Wehadkee silt loam (We). Each of these soils represents alluvial deposits occurring on stream floodplains. Members of the White Store series are a relevant example of category (B) soils. Profiles of White Store soils derive from decomposition of sandstone and shale deposits in the eastern and southern portions of Chatham County. Clays comprising category (C) include the Georgeville series, which have developed from materials in the Carolina Slate Belt. Typical of the Carolina Slate Belt are fine-grained volcanics such as rhyolite, argillite, and slate (see Stuckey 1965:90-104).

The clay samples from the Haw River Reservoir are summarized as follows (see Figure 4.7).



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA
 COMMONWEALTH ASSOCIATES, INC.

FIGURE 4.7
CLAY SAMPLE LOCATIONS
TECHNOLOGICAL CERAMIC ANALYSIS

Category (A)

- 1) A gray, sandy clay with some patchy yellow-brown coloring throughout from a small stream feeding into the Haw River. The clay possesses poor plasticity. There is a moderate amount of organic matter present and a fairly large amount of sand, probably too much to make this a useful clay for pottery. This sample comes from the B1 horizon of the Wehadkee series.
- 2) A dark gray-brown silty clay with a high organic content (some plant material visible) from the bank of a river channel. The organic matter may contribute to the good plasticity of the clay. The sample is probably from the B3 horizon of the Wehadkee series.
- 3) A dark red-brown clay from the river bank with a moderate amount of organic matter and sand. This clay has poor plasticity and low density. The clay might be usable if mixed with clays of better forming qualities. The sample is from the C3 horizon, Congaree series.
- 4) A very sandy medium orange-brown clay from a creek bank. The high (50 percent) sand content gives it a crumbly texture, low plasticity, and low strength. The sample is from the C1 horizon, Congaree series.
- 5) A dark red-brown sandy clay similar to numbers 3 and 4 above. Despite its sandy quality it is fairly plastic and workable. The sample is from the C2 horizon, Congaree series.

Category (B)

- 6) A mottled gray-yellow-brown sandy clay from the top of a large knoll in the floodplain (near backhoe trenches 1 and 2) and approximately a half meter below the surface. The color suggests a high iron content and some organic matter present in various parts of the clay. The clay possesses good plasticity. The sample is from the B2g horizon, Wehadkee series.
- 7) A clay similar to number 6 above from the side of the same knoll. Clay samples were recovered from soil units mapped as White Store (Jurney et al. 1937). Identification of these clays as Wehadkee documents the micro-variability within large scale soil mapping units.

Category (C)

- 8) An orange-red primary clay from the side of the hill above the floodplain. The clay contains no sand and only a very small amount of organic matter. It may have been

mixed with some of the clays from groups A and B to produce a more workable clay. Georgeville silty clay loam.

- 9) A dark red primary clay from the top of the same hill as above. It may, like number 8 above, have been mixed with other clays to improve their working properties. Georgeville silty clay loam.

The third step of technological analysis of Haw River ceramics involved a preliminary sorting of sherds. The sherd sample examined in this step included approximately three hundred fifty (350) ceramic artifacts excavated from 31Ch8 and 31Ch29 during 1979. Portions of five discrete vessels comprise an important component of this sample.

Augmenting this data set were 133 sherds from the 1974 UNC Haw River archeological investigations, obtained through the courtesy of Joffre L. Coe. Provenience of the UNC sherd sample is 31Ch29, thus complementing the small sample recovered from that site during the 1979 Commonwealth field efforts. Specific provenience of the artifacts provided by UNC is the plowzone; Appendix 3, Table 4 presents accession details.

A preliminary sorting of these 450+ artifacts grouped sherds by obvious co-occurrence of differences in attributes, reflecting texture, "temper" amount and type, thickness, presence of "coring," and so forth. These groupings served as a first approximation to technologically distinct categories. A hand examination was sufficient to yield these rough results.

This step of technological analysis provided an opportunity for initial assessment of "temper," or more appropriately, of non-plastic inclusions in the pottery. Temper is a frequently misused term in the archeological literature (see discussions in Matson 1965; Shepard 1968); its use should imply deliberate addition of non-clay materials to improve the working qualities of pottery clay. In reporting the nature (size, shape, mineralogical character) of non-plastic inclusions in archeological ceramics, the tendency has been to call all this material temper, ignoring the possibility of naturally occurring inclusions of sand, pebbles, and crushed rock. It is often difficult or impossible to distinguish deliberate from natural inclusions by a simple microscopic examination of sherds. Reference to non-plastic or plastic inclusions is neutral and avoids misplaced attribution of intent. It seems likely that much of the "temper" in the pottery examined probably occurs naturally in the alluvial soils. Certainly the quantity of sand present in some of the local pottery — enough to seriously weaken the fabric — argues against deliberate inclusion of sand as temper.

The next stages of the technological examination proceeded with a smaller sample of Haw River sherds selected as representative of data variability. This sample of 34 artifacts included 14 specimens from the 1974 UNC data set, 16 specimens from individual vessels excavated in 1979, and 4 additional sherds from the 1979 investigations.

The sherds selected for further examination were ground on a steel plate with two grades of alumina as an abrasive. A slurry of, first, coarse and then fine grades of alumina was used to obtain a ground surface on the edge of a sherd. The sherds were ground on a convenient edge chosen to provide a representative cross-section and to minimize damage to the sherd. When ground to the desired smoothness, the sherds were washed with water and brushed to remove grit trapped in crevices. In this state they could be examined with a hand lens and under the low-power objectives of a binocular microscope. This treatment proved to be sufficient for the purposes of analysis. Further grinding and polishing on glass plates with finer grades of abrasive is possible if a better surface is required for photography or higher magnifications.

It should be stressed that the technological variables outlined below and their interaction should be considered in deriving implications about the technological processes or conditions responsible for observed features of the pottery. There is no simple correspondence between variable states and technological processes. Similar observed characteristics of the pottery may be the result of very different technological processes because of the complexity of the interactions between variables in pottery manufacture.

Particular attention was directed to the following variables:

- 1) The amount of non-plastic inclusions, their type, and physical condition. Cracking, the angularity of the mineral inclusions, the presence of reaction zones between inclusions and clay, the directionality and alignment of inclusions and voids, and color changes due to heat or chemical environment can all be informative.
- 2) Oxidation and reduction states, in themselves, may not be particularly important to a technological analysis. It is clear that they may vary from vessel to vessel, or even within one pot, because of accidents of firing. However, consistencies in oxidation state — e.g., consistently oxidized exteriors or interiors or coring/banding — may point to deliberate attempts on the part of the potter to produce certain effects. Care must be taken to avoid facile conclusions on the oxidation state derived from observation of the color alone. A gray, "reduced," color can be the result of several factors other than the presence of reduced iron in the clay. The organic matter contained in the clay for some "coring" in pottery. Most of the clays examined contained at least some organic materials.
- 3) The degree of clay mixing may be an indication of the quality of local clays and of attempts by aboriginal potters to obtain desirable characteristics in their products by the manipulation of available resources. Poor mixture will generally result in a weak fabric due to the differences in the firing behavior of the constituent clays.
- 4) The degree of vitrification gives some indication of firing temperature, although there is no simple relationship between temperature and vitrification. Glass formation will begin at different temperatures depending on the atmosphere, the presence of fluxing

agents, and clay composition. However, glassiness is usually not evident until a fairly high temperature has been attained in firing. Glassy flow of clay particles results in greater hardness and strength so that some vitrification is usually a desirable property in ceramics. The degree of vitrification may be indicated by the amount of glassy flow around the edges of holes and cracks in the fabric, the presence of reaction zones between clay and inclusions, the shrinkage of clay away from the edges of inclusions, and the presence of conchoidal fracture (visible under the microscope). The glassiness of a fabric may be manifested in the "ring" of a piece, a greater degree of vitrification resulting in a sharper ring.

- 5) Degree of porosity and density gives some indication of the type and origin of clay constituents, the presence of gas-evolving substances, the presence of organic matter, and the adequacy of clay preparation (mixing and kneading).

A fourth step of technological analysis — examination of sherds with a low-power hands lens (5x magnification) — refined the above groups and focused attention on those variables specifically related to technological processes, e.g., inclusion type and amount, clay texture and color, the degree of clay mixing, the extent of vitrification, hardness, and oxidation state. Examination with a hand lens proves to be one of the most useful procedures in a technological analysis of pottery. Most of the technologically significant features can be distinguished at this scale. Variables in this middle range may be more informative than those on a smaller scale, visible under a microscope where irrelevant features, "noise," may mask some important variables. More may be gained by inspection of less detail over a wider area than of irrelevant detail in a restricted field of view.

Finally, examination with a binocular microscope (10 to 40x magnification) contributed additional information to the results of the hand lens examination. In general, this simply reconfirmed the sorting made by procedures (3) and (4) above. It was of greatest value in identifying mineral inclusions and characterizing the degree of vitrification. The type of inclusions proved not to be a major factor in this technological analysis, given the small range of variability in the inclusions noted. A number of different silicates occur in the pottery in no particular pattern. No grouping by inclusion type seemed possible, with inclusion types cross-cutting the technological categories of sherds.

Statistical Analysis

Statistical and quantitative investigation constitute the second component of Haw River pottery analysis and were undertaken with several considerations in mind. First, explicit data quantification provides a means for establishing replicable analytic statements. Second, the results of statistical analysis can be contrasted and integrated with results of technological analysis. Third, statistical procedures aid in examination of extensive data sets — such as the subtle variability expressed in Haw River ceramics. Fourth, the analytic power of statistical methods, particularly multivariate techniques, aids in resolution of data patterning.

The four concerns define specific aspects of this analysis and include:

- (A) Definition of ceramic variables,
- (B) Quantification and numerical coding of variables,
- (C) Inspection of univariate and bivariate attribute expression,
- (D) Examination of multivariate attribute patterning in the data, and
- (E) Integration and synthesis of statistical results.

The statistical examination of Haw River sherds was limited to specimens recovered from excavation context, i.e., to those pottery fragments with controlled horizontal and vertical provenience. A number of ceramic artifacts from Haw River sites 31Ch8 and 31Ch29 met this criterion. See Appendix 3, Table 3 for details. Recovery techniques for artifacts (ceramic and lithic) at the Haw River sites have been detailed earlier in this chapter.

Laboratory sampling and coding of variables for ceramic sherds was conducted by J. A. Newkirk, following procedures developed during the course of research for her Master's thesis at Wake Forest University on the Parker Site (31 Dv 4) in Davie County, North Carolina (Newkirk 1978). Procedural details may be found in that report, but several introduced biases for the Haw River analysis should be identified.

A sampling strategy was implemented that favored selection of sherds with a minimum surface dimension of one inch (25 mm) or more. This strategy prevented the inclusion in the sample of many small, often eroded sherds. The all-too-common problem of trying to deal with large numbers of "crumbs" or "sherdlets" was thereby avoided. However, the differential breakage of vessels and sherds resulting from various techniques of manufacture has undoubtedly affected the rates by which ceramic sherds were deposited in, and recovered from, archeological contexts (Chapter 12). Structurally weak sherds or those exposed to more intense comminution processes will tend to be overrepresented (numerically) in any archeological sample, and (importantly) underrepresented in a selection process such as the one employed here. Therefore, it must be emphasized that the Haw River pottery fragments used for these analyses cannot be considered a perfect representation of all available sherds or vessels from the sites.

These sampling considerations produced for statistical inspection a count of 645 aboriginal pottery sherds. Of these 645 sherds, 560 were classified as vessel body sherds, 76 as rim sherds, and 9 sherds as basal fragments. Site 31Ch8 produced most of the specimens — 629. Only 16 sherds from site 31Ch29 were examined statistically. Two hundred sixty-four (264) fragments were recovered from features during field operations. These 264 sherds represent the five vessels discussed above in the technological analysis.

The ceramic attributes selected for this statistical study were (1) those defining typological profiles in the literature, (2) those defined as meaningful from previous quantitative investigations of Piedmont ceramics (Newkirk 1978; Barnette 1978; Snively 1978a, 1978b), and (3) those attributes discovered by technological analysis to vary significantly. An

explicit strategy guiding variable selection was to capture the fullest amount of information possible. Although this approach is susceptible to error in the form of information redundancy and sampling error, several considerations encouraged this perspective.

Pottery is the product of complex interactions between clay, clay treatment, firing temperature and atmosphere, the length of firing, and the type and amount of non-clay materials present. To classify sherds without considering the possible factors affecting the nature of the final product can only lead to confusion. For example, the speculation by Wilson (1976:36,40) on the role of crushed feldspar as an intermediate stage between crushed quartz and sand ignores the possible functional equivalence and interchangeability of these materials as temper, does not consider the possibility of natural occurrence of nonplastic inclusions in some of the clay, and posits unsubstantiated relations between temper types and pottery characteristics. A statement by Wilson (1976:40) illustrates well these concerns: "The end product [of the use of crushed feldspar as a temper] would be much thinner than previous pottery, and more closely resemble the historical ceramics." Speculation of this sort should be replaced by explicit measurements of the known variation in ceramic traits.

Variability of two other pottery characteristics — color and hardness — further supports arguments for extensive data examination. As Shepard (1968:347-348) notes, color is "conditioned primarily by the composition of the raw clay" and "may have no temporal or cultural significance." Clays from very different contexts may fire to the same color, while similar clays may fire to different colors depending on the oxidizing/reducing nature of the firing atmosphere, the firing temperature, the type and amount of non-clay (e.g., organic) matter, salts, and trace substances. Even within a single vessel there may be color differences indicative of compositional differences in the clay or non-plastics, the degree of clay mixing, and the accidents of firing. It may, therefore, be highly misleading to classify sherds on the basis of color without considering the range of variables affecting the color of the final product.

Hardness is an ambiguous term reflecting one or more of several physical properties of ceramics (Shepard 1968:113-117). Hardness "may mean resistance to penetration, abrasion, scratching, crushing and resistance or elasticity" (Shepard 1968:113). Various standard hardness tests examine different properties or combinations of properties. Even the testing of one property is a difficult process when the material tested is inherently heterogeneous like pottery. The common scratch test using the Mohs hardness scale minerals, for example, is by no means a straightforward matter. Mixing of clays and the presence of non-plastic inclusions in various proportions within one vessel may result in highly variable results, since more than one variable is contributing to the hardness measure. Contrary to McCormick (1970:78), there is no uniform relation between degree of firing and hardness. The hardness of aboriginal pottery may or may not be a useful measure, and must be considered in the light of the complex interaction of factors affecting "hardness," and of the fundamental ambiguity of the term.

These considerations suggest that oversimplified correlations between technological variables and cultural or chronological classification must be avoided in defining pottery types constituting a series. The statistical procedures applied to analysis of Haw River pottery attempt to circumvent these problems by appeal to extensive, explicitly defined data. Table 1 in Appendix 3 presents the variables examined for each of 645 ceramic artifacts from Haw River sites 31Ch8 and 31Ch29.

Successful quantification and coding of this information was straightforward. For any given characteristic, the range of variability expressed in the Haw River pottery sample was established by reference to data from technological analysis and by a preliminary inspection of the sherds. A set of mutually exclusive categories or variable states which cumulatively captured attribute variation was defined for each trait. These variable states were assigned fixed codes; some code states contained only nominal information, while others reflected ordinal or interval measurements.

The variables FIRING and EXTERIOR INCISING are examples of nominal variables. Variation in sherd firing is measured by six mutually discrete nominal categories. Each sherd can be coded for one and only one FIRING category. In those few situations where a single sherd exhibited several variable states, hence violating coding integrity, the predominant trait was coded. Several nominal variables, e.g., EXTERIOR INCISING, were measured by simple dichotomous present/absent options. Ordinal variables include several technological and stylistic characteristics such as EXTERIOR CORD MARKING and POROSITY. Variable states for these traits measure relative degree. In order to accommodate the inherent variability subsumed under any ordinal category, an explicit bias towards measurement modalities and extremes guided coding decisions. This procedure minimized ambiguous data description — those cord markings coded "wide" are uniformly larger than "medium" sized markings. Ideally, this procedure accomplished "noise" suppression rather than information loss. Interval-level variables were measured by appropriate metric values.

The numerical coding of ceramic information proceeded with the goal of general objectivity in data assessment. Table 1 in Appendix 3 reports the quantitative information measured on Haw River pottery. Mention should be made that the "nesting" of certain variable states on the numeric code sheet (e.g., temper) was designed to facilitate laboratory processing; these data required minor manipulation and reformatting prior to statistical investigations. All data transformations and statistical analyses were performed using facilities supported by IBM System 370/3033 at the Computer Center, The Pennsylvania State University, University Park, Pennsylvania.

Initial inspection of attribute expression from a statistical viewpoint focused on univariate descriptive summaries. Individual attribute state tallies were produced by appropriate subroutines and procedures from statistical computer libraries (e.g., SAS, SPSS). Examination of these data indicated preliminary patterning of ceramic traits. By isolating the specific vessels recovered during field operations, these patterns became even more instructive. These preliminary statements about Haw River pottery provided outline information for subsequent analyses.

Transformation of the various quantitative ceramic data into comparable levels of measurement was an extension of distribution inspection. Previous experience with multivariate statistical analysis of extensive ceramic data had demonstrated the efficiency of data measurement standardization. This standardization was accomplished by recoding all ordinal and interval data into nominal binary present/absent data. Binary transformation rules were to a degree *ad hoc*; examination of attribute state frequency counts indicated the relative approaches to variable recoding. In several instances, such as MUNSELL COLOR and SHERD CURVATURE, several variable states were grouped together to form a new variable which was then coded as present/absent. Alternatively, each nominal category of a particular trait was redefined separately (e.g., the different sizes of EXTERIOR CORD MARKING).

Recoding operations in the variables presented in Appendix 3 Table 1 and the data presented in Appendix 3 Table 3 produced a list of one hundred nineteen (119) binary two-state (present/absent) variables — see Table 2 in Appendix 3. These variables form the information set used in succeeding statistical analysis.

Frequency distributions for each of the 119 binary variables were reviewed. Separate histograms were produced for the inclusive set of Haw River sherds, as well as for each of the five vessels. Patterns emerging from these descriptive profiles established useful reference data for later interpretations of multivariate features.

Study of bivariate association among the 119 variables followed directly from uniform binary coding. Statements of correlation or association for binary data depend on several factors. Although a full discussion of those factors is beyond the scope of this report, some of the issues may be briefly addressed. Of particular concern is the respective emphasis, or weighting, given to combinations of variable occurrence. In other words, any given trait or variable may occur on two sherds, may be present on either one but not the other, or may be absent on both sherds. Negative matches, i.e., when two (or more) individuals both do not possess a given attribute, require special attention.

Three different association coefficients measuring the correlation among the 119 binary variables were calculated for all 645 sherds. These statistics were the simple matching coefficient, the phi coefficient, and the coefficient of Jaccard (see Sneath and Sokal 1973; and Bailey 1974 for computational formulae). The simple matching coefficient provided little meaningful information for study of ceramic variable interaction. On the other hand, the phi coefficient, which is the nominal-dichotomous version of the familiar product-moment correlation, and the coefficient of Jaccard, which excludes consideration of negative matches, expressed similar, interpretable patterns of variable interaction.

Sixteen groups of co-occurring variables could be identified from inspection of coefficient values.

These sixteen statistically defined sherd groups represent an initial statement of attribute patterning. However, the inherent complexities of variable interaction (examples are discussed above) prescribe the use of algorithms designed to accommodate these extensive data. Two multivariate statistical techniques, cluster analysis and multidimensional scaling, were applied to the Haw River ceramic data set in order to establish more complete statements of pottery attribute expression.

The multivariate clustering and scaling analyses of Haw River ceramics were complementary in nature. The objective of cluster analysis was creation of sherd groupings, the goal of multidimensional scaling was to establish patterning or ordering among the groups of sherds. These goals were achieved by first creating clusters of sherds according to patterns of shared traits, and by then capturing the structure among these groups through graphical means. The results of these statistical analyses agree well with information gained from technological analysis. When integrated with other archeological data from Haw River investigations, these statistical results translate into specific statements about the identification and temporal themes of ceramic technology in the Jordan Reservoir area.

Cluster analysis, as a technique for studying patterns of attribute covariation, is considered here to be those statistical techniques which seek to define groupings or classes from multivariate data. Cowgill (1977:127-128), in a brief but cogent discussion of quantitative approaches to classification in archeology, labels this approach item-clustering. In other words, cluster analysis groups together those sherds (items) which are most similar with respect to all attributes. These sherd groups may or may not reflect comparable groups of attributes. It should be pointed out that many such object-clustering techniques or classification schemes have been devised (cf. Bailey 1974; Everitt 1974; and Sneath and Sokal 1973); there is no unique mathematical clustering algorithm. Options also pertain to the form and content of the statistical information processed by the respective clustering techniques.

Ward's method, an hierarchical agglomerative technique (Ward 1963), was chosen as the clustering method for this study. This choice was based on several considerations, including (1) recommendations by Wishart (1978), (2) the accuracy tests by Blashfield (1976) which evaluated four agglomerative hierarchical methods in solving 50 generated data sets, (3) the successful application of this technique to other sets of Piedmont ceramic data (Newkirk 1978; Barnette 1978), and (4) evaluation of Ward's method in archeological classification by Goad (1978). In Newkirk's analysis of 1000 sherds from the Yadkin River site 31Dv4, application of Ward's algorithm to ceramic data consistently produced small groups of sherds which either fit together physically, or represented portions of a single vessel. Extensive data sampling of 31Dv4 sherds had masked a prior knowledge of these groups. Barnette, on the other hand, was able to observe separate ceramic assemblages as deflated multi-component sites by using Ward's clustering technique. Hierarchical agglomerative clustering methods refer to those algorithms which successively join, or fuse, N objects into larger groups of first N-1, the N-2, etc., size, logically terminating with one all-inclusive group of size 1 (one). The most similar objects are grouped at the first fusion level, the next most

similar object at the second fusion level, and so forth. Clustering methods such as Ward's contrast with hierarchical divisive methods (e.g., Whallon 1971, 1972), partitioning techniques, and mode-seeking techniques, among others.

Ward's method calculates the grouping among objects by reference to a matrix of measures of association, such as phi or the coefficient of Jaccard. This matrix is a summary statement about the similarity or association between and among objects (pottery sherds). For this study of Haw River sherds, the association measure chosen was a dissimilarity of distance measure, the binary form of squared Euclidean distance (see Bailey 1974 for details).

Perhaps the best known minimum variance method, Ward's method uses the minimum increase within cluster variation as the criterion for fusion of objects (sherds). This variation is measured by the sum of squared deviations of every point from the cluster mean (error sum of squares), as defined by Bailey (1974) and Everitt (1974). As such, Ward's method is meaningful only when distance coefficients have been calculated. However, as Wishart (1978) points out, the error sum of squares coefficients degenerate to distance (except for some constant scalar multiplier) when used to measure the similarity between two individuals. This coefficient does retain its identity when used as an intercluster measure, which is significant for the problem of reallocation.

Because hierarchical techniques do not allow the reallocation of individual objects once they have been assigned to a specific cluster, further refinement of any clustering solution is necessary. This procedure considers in turn each of the k clusters at a given level of fusion (i.e., for any given number of clusters, $N - 1$). An individual object (sherd) is switched from one cluster to another if that change increases cluster homogeneity, as determined by error sum of squares criteria. The characteristics of the new "cleaner" cluster are then recalculated. It may be noted that the number of reallocation interactions necessary for stable reassignment can serve as a measure of clustering success. Reallocation procedures can begin from one of two types of initial configurations. The first case passes a cluster-solution classification, e.g., the classification results from Ward's method, to a reallocation algorithm. The second situation requires specification of random individual objects as "seed points" defining the initial cluster centers. As an example of the analytic options open to researchers using cluster analysis, Johnson and Johnson (1975) derived their classification of Kansas City Hopewell sherds directly from a version of random starting configurations — the K-means technique. In contrast, the present study of Haw River ceramics used a two-step clustering strategy: the clusters of sherds produced by Ward's hierarchical method were directly evaluated by reallocation procedures.

One component of statistical investigation of Haw River sherds was cluster analysis. A second component, multidimensional scaling (MDS), extended the results of cluster analysis and provided additional insight into aspects of pottery technology in the Haw River area. Shepard (1972:1) characterizes the purpose of multidimensional scaling as that

. . .of representing [the data] structure in a form that is much more accessible to the human eye — namely, as a geometrical model or picture. The objects under study . . . are represented by points in the spatial model in such a way that the significant features of the data about these objects are revealed in the geometrical relations among the points.

In this application of MDS techniques, "the objects under study" were groups of Haw River pot sherds. More specifically, the points in "the spatial model" displayed by MDS output correspond to the set of cluster groups produced by the preceding analysis. The relationships among these points were determined by variable co-occurrence in the respective cluster groups.

The data structure for this multivariate data of $n=119$ binary variables is pristinely captured in n -dimensional space, where n is usually annoyingly greater than three. The "trick" in multidimensional scaling is the translation of that data structure into lower dimensions which can be depicted geometrically, while simultaneously minimizing the attendant distortion of relationships among the data points. If this can be accomplished, the resultant relative distances between points reflect relative differences (Cowgill 1972:390).

Analysis of Haw River ceramic data structure from the perspective of MDS was undertaken using the computer program KYST (Kruskal, Young, and Seery 1973). KYST requires a summary presentation of the relationships among the items, or data points, as expressed in an uncompressed n -dimensional space. This summary takes the form of the familiar association matrix. The Euclidean distance measure was chosen because of the general analytic merits of this measure as well as for the Euclidean spatial properties of multidimensional scaling. Distance coefficients were calculated for each pair of data points (sherd groups) using options available in the CLUSTAN library (Wishart 1978). These Euclidean coefficients summarize information about the relative contribution of each of the 119 binary variables to each sherd-grouping; i.e., for any given sherd-group, the percentage occurrence of the respective binary variables may be viewed as measurement weights. Standardization of these attribute percentages with respect to the cluster groups controls for variation in sherd-group sample size.

CHAPTER 5

ENVIRONMENTAL SETTING

INTRODUCTION

The focus of this chapter is the identification of geologic, geomorphic and biotic components of the contemporary landscape. The geoarcheological model developed further on attempts to outline the chronology and sequence of terrain changes recorded in the alluvial sediments. In developing this model it is first necessary to understand the present landform configurations and geomorphic successions that articulate the present riparian life zone along the Haw. Such variables as physiography, topography, drainage, and biota delimit life-zones or subsistence environments; in a sense, the present setting provides a relatively stable frame of reference both for viewing the natural habitat and for understanding the nature, composition and dynamics of those landscapes once exploited by aboriginal groups. The following account outlines those components and dynamic geological processes of the contemporary Haw River catchment that bear most directly on the prehistoric environment.

MODERN PHYSIOGRAPHY, TOPOGRAPHY AND DRAINAGE

The Haw River archeological sites are located along the Haw River on the central eastern edge of a region of rolling hills in North Carolina known as the Piedmont Plateau. Geographically the Piedmont province of North Carolina extends east-west for approximately 150 miles, separating the Blue Ridge Mountain province to the west from the southeastern Coastal Plain. Technically the Piedmont is the "non-mountainous portion of the older Appalachians" (Fenneman 1938) and its plateau surface formed as a result of degradation. The plateau generally slopes from the mountains eastward toward the Coastal Plain. Inner Piedmont topography in the Carolinas is relatively rugged and semi-mountainous. The relief is attributed to both the presence of abundant monadnocks near the mountain front and the relatively steep slopes at the headwaters of the major streams emptying east and southeastward into the Coastal Plain. The mountains of the inner Piedmont are extensive and are clearly separated from each other and from the Blue Ridge chain by deeply incised valleys.

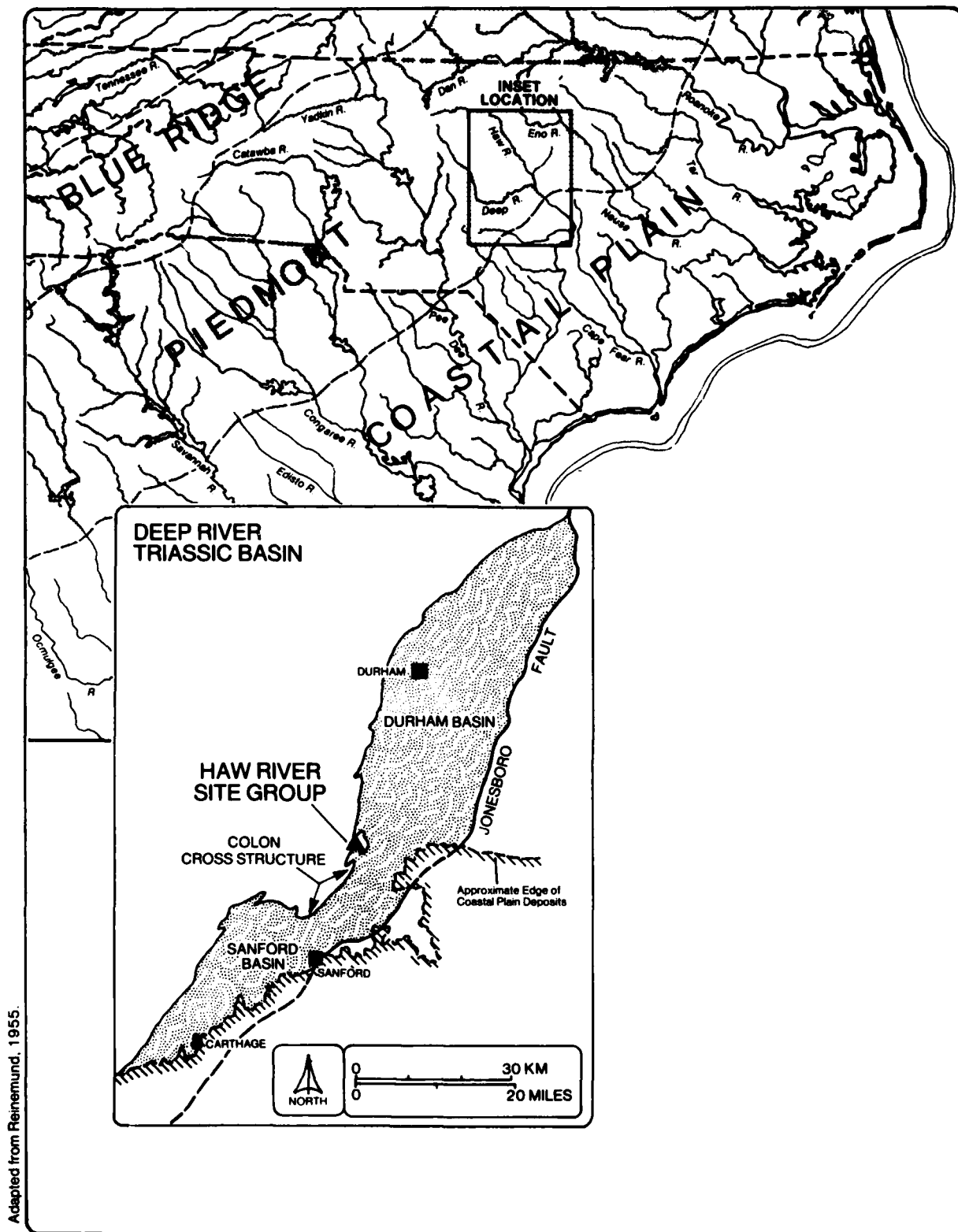
The eastern boundary of the Piedmont province is structurally delimited by a zone of igneous rocks underlying sedimentary rocks of the Coastal Plain. In most places, the juncture is a zone of steeper hills and downcutting channels that grades to the gentler slopes and more broadly spaced streams of the Coastal Plain. The zone broadly trends along a northeast-southwest axis and is referred to regionally and along the Atlantic Slope as the Fall Line, originally named for the prevalent rapids or falls occurring at abrupt breaks in the gradient.

Stream drainage and flow from the Piedmont is relatively swift, but as Fenneman (1938) and Renner (1927) have emphasized, south of the Potomac the edge of the Piedmont province is not a strongly differentiated topographic feature. The falls themselves are largely localized and reflect variable erosion of the underlying heterogeneous bedrock masses. In fact, the actual location of the Fall Line in the Carolinas is obscured by the fact that many streams, including the Cape Fear River, have entrenched their channels in crystalline rock and are interspersed with rapids for over 20 miles after debouching into the Coastal Plain (Holmes 1899).

Physiographically, the Piedmont/Fall Line zone is best viewed as an uplifted peneplain in various stages of dissection (see Fenneman 1938). In the project area the peneplain surface has a general southeasterly slope grading from 1000 feet (ASL) in the west to 300 feet (ASL) at the Fall Line. The Piedmont Plateau in the site vicinity features generally low relief (less than 100 feet). Irregular and steeper topography has been created by the dissection of locally superposed streams across the erosion-resistant metavolcanic rocks. The more gentle topography to the east is a structural expression of the moderate downwarping of the Jonesboro fault that produced the Deep River Triassic Basin of North Carolina (Harrington 1951) (see discussion).

The confluent channels of the New Hope, Haw, and Deep Rivers drain the Piedmont Plateau at the western margin of the Deep River Basin (see Figure 5.1). These fluvial systems have produced a lowland topography in the basin with slopes generally trending riverward. There are few prominent ridges or hills, the highest ridges in the region being formed on beds of siltstone or fine-grained sandstone in the southern portion of the basin southwest of the Haw River sites. Alluvial terraces of the Deep, Haw, and Cape Fear Rivers, and along some of the larger creeks, form the most extensive flat areas in the lowland (Reinemund 1955:15). When viewed from the southeast edge of the Deep River Basin, the relief appears to be very gentle, flat, and smooth over a wide area, interrupted only by intermittent monadnocks that rise several hundred feet above the flat plateau surfaces.

Stream activity is the prime geomorphic process that has modified the Piedmont landscape and relief in Quaternary times. This is evidenced by the intricately dissected surfaces that comprise the Triassic lowland. The many streams which drain the catchment form a dendritic network, flowing primarily in a southerly or easterly direction. In general, interfluvies are sharp and narrow near the primary streams, but farther from the main arteries they become progressively higher, broader, and flatter. Most streams in the lowland are actively incising their channels at present (Reinemund 1955). Steep-sided valleys with narrow floodplains are the norm. Although the floodplains are generally not laterally extensive, some have swampy basins near confluences of major streams. As an example, Cedar Creek, a tributary of the Deep River, features some of the more prominent swamplands in the basin, but the Deep River itself is actually eroding a former alluvial fill and cutting down into bedrock in many places (Reinemund 1955).



Adapted from Reinemund, 1955.

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FIGURE 5.1
PHYSIOGRAPHIC PROVINCES-
SOUTHEASTERN UNITED STATES

The Deep, New Hope, and Haw Rivers are the principal arteries draining the Deep River Triassic Basin. The Deep drains southeastward across the Piedmont Plateau from its sources in Guilford and Forsyth counties, meandering eastward across the basin to its confluence with the Haw near Moncure. The drainage area of the Deep above Moncure is 1390 square miles and it falls about 800 feet across the basin (Reinemund 1955).

The Haw River originates in Guilford and Rockingham counties and flows southeast across the Piedmont Plateau, entering the Deep River Basin lowland two miles north of Moncure. It is a relatively fast-moving river in a narrow, steep valley. Tributaries to the Haw drain the western part of the Durham Basin and adjacent portions of the upper Piedmont (see Figure 5.1). The drainage area of the Haw above Moncure is 1760 square miles and, at its mouth, the gradient is significantly steeper than that of the Deep.

The New Hope River, the major tributary of the Haw, drains into the main channel about 4.5 miles north of the Deep-Haw River confluence. The New Hope is a slow-moving channel with a comparatively wide floodplain and gentle stream gradient.

Flow characteristics and discharge seasonality of the Deep, Haw and New Hope Rivers are crucial variables accounting for the alluvial features and floodplain morphology of each drainage. Superficially, regional discharge rates are very similar, with 10 year discharge means for the Haw and Deep rivers in the range of 2500-2600 cfs. This is ostensibly a reflection of the plentiful and uniformly distributed rainfall pattern producing perennial flow in most primary streams in the Piedmont (see Reinemund 1955:18-20). The Fall Line area, straddling the Piedmont/Coastal Plain transition, is sensitive to discharge seasonality rather than to gross annual means, since flooding cycles are markedly different between the two physiographic provinces. Riggs' (1955) study of flood magnitude and frequencies in North Carolina shows that seasonal flooding extremes are much more characteristic of the Coastal Plain, occurring in late winter and summer. Significantly, flood regimes are different between seasons with major summer floods producing higher discharges than those of winter. While cycles are somewhat variable, Riggs' (1955, Figure 19) flood frequency curves indicate that over protracted time intervals, the differential between summer and winter discharge maxima increases exponentially. Discharges for 30-year peak summer floods are twice as great as they are for winter floods. The significance of long-term discharge patterns is most critical in explaining rates and periodicity of sedimentation and in accounting for changes in floodplain morphology. Such considerations are elaborated in the geoarcheological reconstruction for the Haw River (see Chapter 6).

Generally, in the Deep River Basin lowlands, constant and continuous stream flow is standard due to gentle gradients and a proliferation of springs. Stream tributaries are more sensitive to hydrographic variables depending on their physiographic location and the geology of the immediate catchment, and may feature more intermittent flow.

Stream discharge is more variable in the Piedmont Upland, to the west, where the flow of even the permanent larger streams is comparatively erratic. Once the streams debouch onto the Coastal Plain, smaller channels are only active during periods of rainfall, since drainage areas are constricted and differential runoff/infiltration ratios regulate the water flow.

Springs are abundant and widely distributed across the Deep River Basin, but are less common in the adjacent Piedmont Plateau and Coastal Plain. Principal locations include contacts between diabase dikes and granite intrusives with surrounding rock; along contacts of sandstone and conglomerate beds overlying impermeable strata; along river terrace edges, and along structural faults or joints (Reinemund 1955:21). Springs are most numerous along principal drainages of the western Deep River Basin and are responsible for the permanent flow of many streams. Additional groundwater sources include aquifers situated as much as 100 feet below the surface which transport water along cleavage planes and joints of crystalline rocks. Such sources are less common in the eastern portion of the basin proper due to the thickness and impermeability of underlying siltstone and claystone.

Availability of water resources was one of the most critical variables in determining the locational preferences of prehistoric populations at the Haw River sites. Significantly, the sites are situated near the confluence of the New Hope River with the Haw, and only five miles north of the confluence of the Haw and the Deep Rivers, which form the Cape Fear River. The Cape Fear is one of the major Piedmont-Coastal Plain drainage networks in North Carolina. It breaches the escarpment marking the inner edge of the Coastal Divide along the southeast edge of the Deep River Coal Field in Chatham, Lee and Moore counties. Streams to the northwest of this divide, in the lower portion of the basin, drain directly into the Deep and thence into the Cape Fear, while streams in the northern basin ultimately empty into the Cape Fear from the southwest. Finally, southeast of the drainage divide, channels are tributary to the Little River, a branch of the Cape Fear.

As indicated earlier, alluvial plains are narrow in the Haw and Deep River drainages, generally overlying bedrock with clastic accumulations of only several feet. Near Moncure the modern floodplains of both rivers are less than one quarter mile wide. The Haw River alluvium accumulates largely along the eastern bank and is only 350 feet wide in the project area. Outcrops of the earlier terraces of both river systems flank the floodplain. South of the confluence of the Haw and the Deep rivers, the floodplain fans out to a width of one mile (near the junction of Shaddox Creek). The Cape Fear floodplain then widens appreciably as feeder streams merge carrying fine sediment loads and flowing along gentler gradients.

All of the floodplains in the research area are subject to periodic flooding. The nature and degree of sedimentation is highly variable in these alluvial microenvironments characterized by back swamps and terraces. Early soil surveys of Chatham County (Jurney et al.

1937) mapped Congaree silt loams and Congaree fine sandy loams as the major soil associations of the lower Deep and Haw River drainages respectively. The latter are confined to the eastern bank of the Haw where the archeological sites are located. These soils are generally brown to light brown in color; surface soil depths range from 15 to 18 inches for the silt loams and 10 to 12 inches for the sandier soils. Subsequent revised surveys have assigned the Congaree soils to the White-Store-Creedmore Association (U.S.D.A. 1970), indicating that the soils are moderately well-drained and feature mottled yellowish red and gray very firm clay subsoils. They have developed in weathered material derived from sandstone, siltstone, and mudstone and occur on "intermediate to broad ridges" (U.S.D.A. 1970) including high Quaternary terraces. Reworking by alluviation and colluviation is frequent and is evidenced by diffuse inclusions of mica and hematite nodules in the sediment matrices. Most of the land has been cultivated at some time, since it is fairly easily tilled except under wet conditions. Erosion is the main hazard, and restrictions limiting intensive exploitation of these soils and mandatory conservation practices have been instituted. The General Soil Map of Chatham County shows that three miles upriver of their confluence both the Haw and Deep River alluvial valleys are considered "steep" areas in which half or more of the land surfaces are on slopes of at least ten percent. These are also the tracts most subject to sheet erosion.

Away from the floodplain in upland locales a wider variety of soils generally have developed *in situ* under forest vegetation over protracted time intervals. They are usually formed from weathered rock material including metabasalts, metadacites, metafelsites, conglomerates and siltstones. The metavolcanics generally weather to red, yellow, or brown clays with minor silt and sand components. The laterite-like clays feature deteriorating rock inclusions and comprise the majority of the residual soil mantles in the hilly regions.

THE BIOTIC COMMUNITY

Biotic communities are the natural resource systems that sustained prehistoric peoples. While a succession of climatic and geomorphic changes during the Late Quaternary resulted in migrations and realignments of biomes affecting human subsistence patterns, shifting man/land relationships reflected modifications of a physical environment broadly resembling that of the present. This account attempts to link distributions of contemporary floral and faunal communities with those topographic and landscape gradients constituting the present regional ecosystem. In this systemic analysis, a spatial framework is utilized for assessing the biotic movement and displacements characteristic of the present regional environment. Chapter 11 examines biotic sequences and assesses their relevance for the changing subsistence strategies adopted by various prehistoric groups. The Haw River project area lies in a sensitive physiographic ecotone: the transitional province of the Oak-Pine Forest (OPF) and Southeastern Evergreen Forest (SEF) (Waggoner 1975). It has been emphasized that regional boundaries with respect to vegetation distributions "... are so indistinct that they can be but arbitrarily drawn ... this is a transition belt where the ranges

of trees of the central hardwood forest and of the evergreen forest of the southeast overlap" (Braun 1950). Consequently, vegetation distribution and dynamics are best understood on the local scale and in the immediate microenvironment.

The undulating topography and metastable landscape configurations at the Haw River site area resulted in a well established dendritic drainage pattern. The catchment's rich and topographically graded vegetation growth may be attributed to these conditions. Upland reaches support a mixed forest of pine and oak consistent with regional Piedmont species distributions. The forest cover here is among the most concentrated in Chatham County which itself has more acreage in forested land than any other county in the Piedmont (Moore and Wood 1976:80). Valley bottom and floodplain locales, with their impermeable clayey subsoils, are more poorly drained. Along the alluvial flats, remnant oxbow lakes, and swales a hydrophytic vegetation cover predominates with swamp forests extending across the floodplain. Gentle slopes bordering the bottomlands provide the habitat for mesic tree communities of which beech, poplar and sugar maple are best developed on the northern exposures.

Within local physiographic limitations, the expansion of particular species and communities (distributions) are strongly affected by such factors as plant/animal relationships, inter-specific competition for light and moisture, epiphytic and parasitic organisms, and of course, human interference. Differential activity on the part of any of these agents alters the environmental balance in the region. Effects may be far-reaching, influencing the extent of inter-community boundaries. In fact, Kuchler's (1973) observation that "While plant communities are the mappable units of vegetation . . . the idea of a continuum challenges their very existence" appears to be true for the area. Transitional communities do exist in the project locale but their borders are continually migrating and difficult to isolate, underscoring the sensitivity of species distributions to even minor environmental stress.

The broad and varied vegetation patterns are in large part attributable to the interaction of climatic and geomorphic variables. Long term trends have been documented by both contemporary plant ecologists and Quaternary paleo-ecologists. It has been noted, for example, that the more varied micro-climates of the Piedmont Province and its complex erosion-sedimentation cycles have allowed for a broader diversity of vegetation types over the course of the Pleistocene (Hardin and Cooper 1967). Locally, the drainage conditions along the Haw River floodplain combined with the humid mesothermal climate (Koppen: Caf) of the Eastern deciduous forest of central North Carolina is conducive to the spread of mesic and hydrophytic communities. Mean annual temperatures average 16°C; the precipitation index is on the order of 132cm per year. Rainfall patterns are not seasonally determined. Increased rainfall during periods of peak heat ameliorate the climate and prevent crop damage from prolonged drought. Mild winters are productive for growing cover crops and a variety of hardy vegetables. The balanced moisture regime and mild climate insures the regeneration of the oak-pine forest in the Piedmont uplands, while the alluvial bottoms

support a variety of hardwoods. The graded slopes of the bottomland periphery offset a local ecotone featuring stands of beech (*Fagus grandifolia*), poplar (*Liriodendron tulipifera*), and southern sugar maple (*Acer saccharum*), with a variety of oaks and hickories stabilizing the higher slopes (see Braun 1950; Moore and Wood 1976).

Moore and Wood (1976:Section V) have grouped the twelve basic vegetation types of the study area into communities based on classic Piedmont topo-edaphic relationships (see Oosting 1942). Basic scrub, forest, and pond communities are recognized and local classifications are modified according to degree, extent, and nature of the canopy cover on given tracts and terrain. The general distributions of types are illustrated in the cross-section shown in Figure 5.2 and a brief account of the general groups follows.

Scrub areas are those which are forested but lack a distinct canopy layer. Their development follows intensive timbering or clearing, after which the succeeding canopy forms. Three scrub communities in the project vicinity feature the prevalent arboreal species in the area. These include pine, hardwood, and mixed scrub communities. Pine scrub is characterized by a proliferation of closely spaced immature pines that crowd out the herbaceous species; pine plantations are encountered intermittently. Hardwood scrub communities occur even less frequently since they are restricted to bottomlands that formerly have been timbered. They are most abundant along creek bottoms and flatlands. Finally, mixed scrub is the type most likely to be encountered in timbered tracts as it occurs in uplands, mesic and bottomland locations and where pines and hardwoods are clustered. Most mixed scrub areas feature uneven canopies of mixed young and immature tree stands.

A wide spectrum of forest types abound in the research area, the most common in the immediate site locale being the bottomland forest, which includes both the alluvial forests occupying the well-drained sand-silt banks and fluvial terraces, and the swamp forests of the poorly drained depressions. The canopy is dense and closed, and is chiefly represented by river birch (*Betula nigra*), sweetgum (*Liquidambar styraciflua*), ash (*Fraxinus spp.*), sycamore (*Platanus occidentalis*), box elder (*Acer negundo*), hackberry (*Celtis laevigata*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), hickory (*Carya spp.*) and loblolly pine (*Pinus taeda*). The swamp forest includes five subspecies of oak as well as hickory and elm.

The mesic forest mainly occupies restricted areas along the steep tributary valleys and well-drained slopes emptying into the bottoms. Three communities are admixtures of beech, sugar maple and poplar. The upland forest is largely populated by oak and pine tree stands — hardwoods are predominant — and a high component of shrubs, herbs and vines. Pines are largely second-growth trees. There is a pine forest as well, which is a transitional community resulting from former timbering and cultivation practices. It sustains itself on mesic and upland sites, and is generally succeeded by a mixed pine-hardwood forest.

Pond vegetation communities complete the floral distribution, and although they necessarily lack closed canopies, the ponds are the habitats for a variety of aquatic plants. Most prominent among these are water lilies, pondweed, duckweed, water-milfoil, spike-rush and cat-tail. Many of these species also occur in the sumps, or bottomland depressions, that dot the floodplain and backswamp areas.

Forest succession is critical to the maintenance of the biotic balance. An outline of general progressions has been provided by Moore and Wood (1976:59ff). Their study suggests that with extensive timbering activity, the upland forests evolve into mixed scrub communities. Ultimately the succession results in the elimination of pine and the establishment of the oak-hickory climax. Detailed studies by forest ecologists have outlined a sequential phase progression: 1) *Dry* — post-oak and black jack oak (*Quercus stellata-Quercus marilandica*) dominant; 2) *Intermediate* — white oak-post oak (*Quercus alba-Quercus stellata*); 3) *Rich* — white oak-black oak-red oak (*Quercus alba-Quercus velutina-Quercus rubra*). These phases are topo-edaphic and micro-climatically sensitive (see Oosting 1942; Waggoner 1975). In the alluvial forest bottoms, the trend is also toward a hardwood climax dominated by river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), and box elder (*Acer negundo*) with ash (*Fraxinus spp.*), elm (*Ulmus spp.*) and red maple (*Acer rubrum*) prominent. The climax for this alluvial microenvironment is the beech-southern sugar maple forest. In swampier pockets the climax is dominated by lowland oaks.

There is no complete list of active faunal forms occupying the area, but preliminary surveys have identified and inventoried the fish and wildlife species (U.S. Army Corps of Engineers 1971). Anadromous fishes are most prolific in the lower reaches of the Cape Fear River while the Haw River contains significant numbers of largemouth bass, pickerel, suckers, and a variety of catfish and shiners. Reptiles and amphibians that commonly occur along the floodplains include turtle, lizard, salamander, toads, frogs and a variety of poisonous and non-poisonous snakes. The most common mammalian species are opossum, squirrel, rabbit, field-mice, raccoon, fox, and muskrat. Deer concentrations in Chatham County are among the highest in North Carolina. Avifauna include wood duck, bobwhite quail and wild turkey.

LOCAL GEOLOGY AND GEOMORPHOLOGY

The geological setting of the Haw River archeological site area has been described as complex, due largely to the deep weathering of most of the rock types and the paucity of diagnostic outcrops of sedimentary rocks constituting the Deep River Triassic Basin. Several major regional studies have been undertaken in the central North Carolina Piedmont, outlining the general chrono-stratigraphy. Foremost among these are geological studies of the Chapel Hill Quadrangle (Mann et al. 1965), the Durham area (Bain and Thomas 1966), the structure of the Durham Triassic Basin (Harrington 1951) and a general survey of the mineral resources of the eastern Piedmont (Wilson and Carpenter 1975). Most germane to

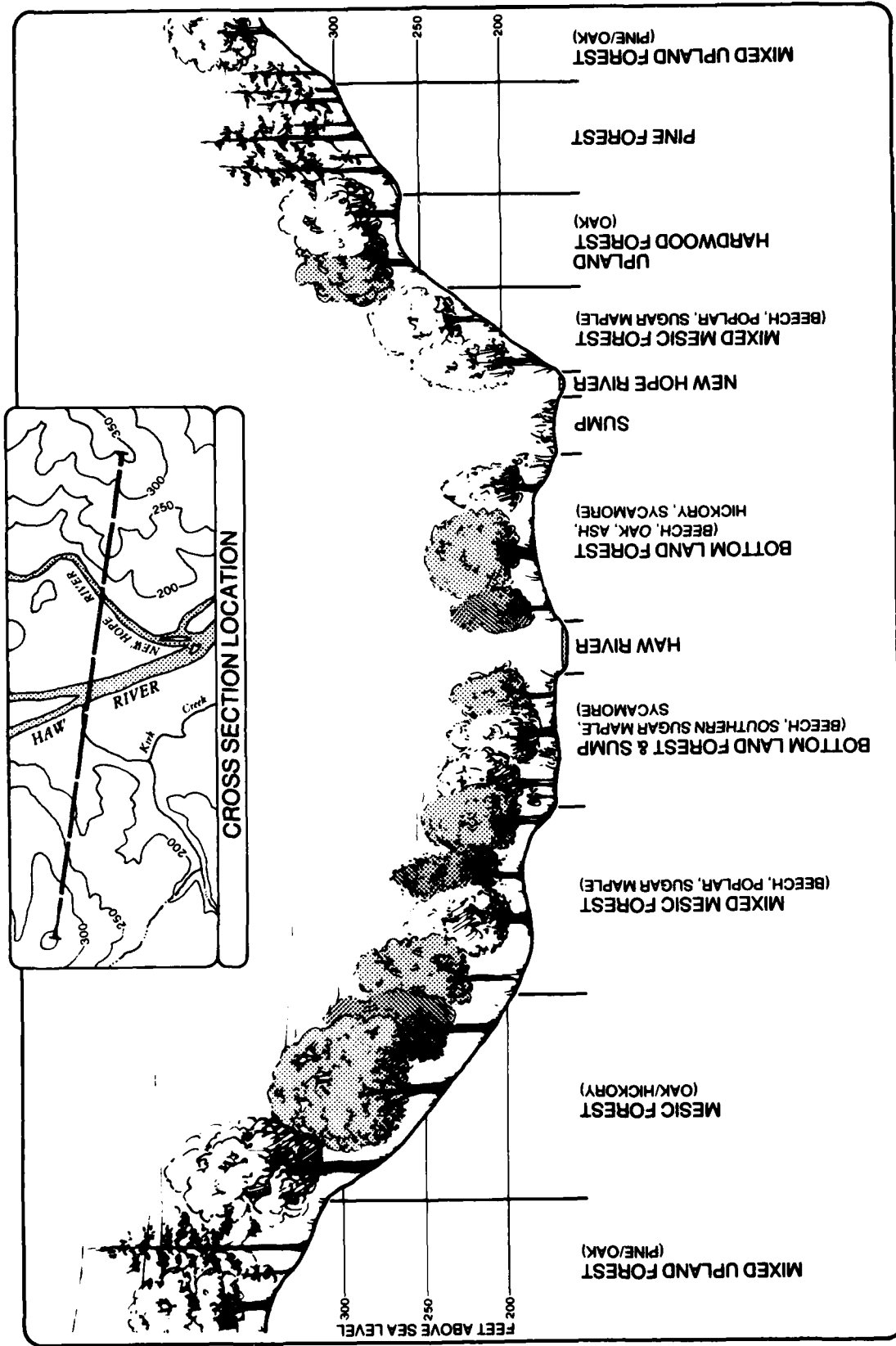


FIGURE 5.2
CONTEMPORARY VEGETATION TRANSECT
ACROSS THE HAW RIVER VALLEY

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the project area is Reinemund's (1955) intensive geologic study of the Deep River Coal Field. This report covers a 10 x 15 mile tract along the Deep River Basin, beginning immediately south of the project area. Many of Reinemund's observations and mapping units bear directly on the site locale and will be both drawn and elaborated upon.

The regional geologic setting is the western margin of the Deep River Triassic Basin (see Figure 5.1). This is a northeasterly trending topographical and structural trough comprised of a wedge shaped block of Triassic rocks. It dips generally to the southeast at a 15° angle (Reinemund 1955:67). The bottom and northwestern edge were created by the irregular contact between these sediments and underlying pre-Triassic rocks. Longitudinal faults and cross faults traverse the Triassic block, dividing it into sub-blocks. As a result the Deep River Basin is subdivided into the northern Durham and southern Sanford basins which are separated by the Colon cross structural (Campbell and Kimball 1923) stricture. In Chatham County, north and southwest of Moncure, the basin trough bottoms out and extends across the eastern portion of the county (Jurney et al. 1937). The Durham sub-basin, locale of the Haw River archeological sites, is ten miles wide and underlain by Triassic sedimentary and metamorphosed igneous rocks which attain a total thickness of seven thousand to ten thousand feet (Reinemund 1955). Most of the boundaries between Triassic rocks and adjacent metavolcanic rocks form abrupt escarpments, delimiting the regional catchment. Underlying the Triassic sediments are pre-Cambrian and Paleozoic rocks that form the base of the Basin. The pre-Triassic metamorphic rocks are intruded by late Paleozoic granites which were subsequently cut by basic dykes, perhaps during the Jurassic. The Basin trough probably originated following a period of gentle downwarp during the early Triassic. Protracted subsidence proceeded by folding and is delimited on the present landscape by the escarpment created by the Jonesboro fault, the southeastern border of the displacement. A series of minor and discontinuous faults then developed along the northwest border of the Durham Basin, characterized by small embayments of Triassic rocks extending into the area of predominant meta-volcanics. Reinemund (1955:Plates 1-3) has carefully mapped these numerous cross-faults, which generally trend northwest-southeast. Cross faulting generally trends in the direction N15°-20°W and is most common west of the Deep River (see Reinemund 1955:Plate 1).

Reinemund's (1955:83) reconstruction of the structural development of the Deep River Basin draws largely from the work of Harrington (1951), who postulated initial downwarp of the terrain coeval with subsequent deposition of basal Triassic sediments of the Pekin Formation. This was followed by progressive late Triassic subsidence of the trough along the Jonesboro Fault to the southeast. Postdepositional movements along the contemporary fault were succeeded first by cross faulting and then by the later longitudinal Deep River fault (Triassic/Jurassic) which is not cut or offset by the cross faults (Reinemund 1955:70). Igneous intrusions occurred by the late Jurassic, after which minor faults developed (Jurassic). At this time structural stability was established and a protracted erosional interval ensued creating extensive planation surfaces. Locally, the faulting is most intricate and an uneven, serrated unconformity marks the downstream contact between the meta-volcanics and the Triassic sediments (U.S. Army Corps of Engineers 1965:10).

Structural features are critical to drainage patterns and, consequently, to the subsequent archeological site distributions. The Haw River sites are located on a gap in a meta-volcanic ridge on the western margin of the Durham Basin. The upstream face of this ridge is a scarp that resulted from differential erosion of Triassic sediments, downfaulted against more resistant meta-volcanics by the Deep River Fault trending northeast along the northern portion of the Basin. The New Hope River is a consequent stream flowing sub-parallel to the faulted contact between the sediments (U.S. Army Corps of Engineers 1965). The Haw River itself follows a course paralleling the north-northwest to south-southeast trends of the cross faults. Current geoarcheological study has documented several more cross faults along the Haw River axis, supporting arguments marking structural elements to explain the transverse flow of the Haw and Deep Rivers (Bain and Thomas 1966). This may be a major factor contributing to the relatively limited accretion that occurs along the present channel floodplains.

Finally, the general geological setting includes Late Cenozoic surficial deposits capping the Triassic and pre-Triassic rocks along the southeast border of the Durham Basin. Fluvial sediments comprise the fill of the Quaternary alluvial terraces of the Haw and Deep River valleys.

Stratigraphy and Lithology

The stratigraphic succession at the Haw River site locale consists of four units which are, in order of decreasing age: the Carolina Slate Series, Triassic sediments of the Pekin Formation, residual Tertiary soils, and Holocene alluvium.

The Carolina Slates, or pre-Triassic rocks, owe their origins to combined igneous, metamorphic, and sedimentary processes (Mann et al. 1965). The component rock units have been mapped by Butler (1963) and are dominated by argillite, slate, phyllite, greenstone, lithic-crystal tuff, breccia and volcanic conglomerates. Cleavage planes on the rocks are sharp and nearly always vertical with strikes to the northeast (Mann et al. 1965:5). Some units apparently record former flow patterns in tuffs and other devitrified rocks, all of which are of volcanic origin. The overlying sedimentary rocks feature relatively unaltered fragments of these meta-volcanic rocks, systematically documenting major erosion during Triassic times (Reinemund 1955).

The most abundant meta-volcanic rocks in the immediate site vicinity are basalts; tuffs and rhyolite occur infrequently. The age of this series is estimated to be Precambrian or Lower Paleozoic (U.S. Army Corps of Engineers 1965). Metabasalts encountered in several exposures are generally dark green to yellow green to gray in color and are of a dense fine grained aphanitic texture. Fractures are common and may be healed or filled by quartz or calcite. Mineral composition is dominated by plagioclase and pyroxenes with smaller amounts of olivine and epidote. Other rocks found in this series include flow breccias, consisting of hard quartz cemented fragments of epidote and calcite, and a group of undifferentiated metavolcanics. The latter are especially striking, as many outcrop fragments have

a very "cherty" appearance. Breccias are most common at upper contacts with the Triassic sediments and their deposition may be associated with faulting (U.S. Army Corps of Engineers 1965). East of the project area chloritic and micaceous schist and gneisses occur. Detrital fragments and eroded deposits of these metamorphic rocks are occasionally found in tributary valleys.

In summary, metamorphosed igneous extrusive and associated sedimentary rocks are the principal components of the Carolina Slate Series. Origin of the slate has been attributed to shallow-water estuarine deposition in land-waste derived from nearby acid volcanic rocks. Banding in some slates may attest to seasonal sediment rate fluctuations in such environments (Alexander 1932).

It is the Triassic rocks of the Pekin Formation and their disposition that have defined the sedimentary and structural contexts in the vicinity of the Haw River sites. The archaeological sites are situated along a floodplain developed on Triassic rocks. Immediately south of the sites, the floodplain constricts, the most prominent geological feature being a meta-volcanic ridge formed between two deposits of Triassic sediments. They are clastic units consisting largely of conglomerates and sandstones forming an elongated body in the valley running alongside the ridge on the west abutment. The Triassic deposits feature abrupt lateral changes in both texture and composition; lithologic units generally attain thicknesses of only several feet. Colors of the rocks are sharp and range from reddish-brown (conglomerates) to red-purple (sandstones) and dark greenish-gray (siltstones and sandstones). Reinemund (1955:26) suggested that these sediments were originally laid down as alluvial fans and stream-channel, floodplain, lake and swamp deposits. In color and texture, the Deep River sedimentary suites compare to those characteristic of most Triassic basins of eastern North America. They have been assigned to the Upper Triassic Newark group, and in the project area, they comprise the lower units of the Pekin Formation. The basal member of this formation is a prominent conglomerate (U.S. Army Corps of Engineers 1965).

The Pekin Formation is the oldest of three sedimentary litho-stratigraphic units of the Deep River Triassic Basin; the remaining units are Cumnock and Sanford, distinguishable by color and lithological differences, though the contacts between them are gradational. Generally the Cumnock Formation is characterized by shale and blackband lithologies.

The Pekin Formation is thickest (up to 10,000 feet) along the southeast side of the Deep River Basin, where coarse-grained sediments are most typical. Borings taken in the site area revealed that the most prominent member of this unit is a quartz pebble conglomerate, green to purple and gray in color, consisting of subangular to rounded volcanic pebbles (U.S. Army Corps of Engineers 1965) with a high rounded quartz component. The grains in the matrix have a hard, shiny, dark brown ferruginous coating that imparts the dark reddish brown color to the conglomerate. Fresh exposures are characteristically strongly indurated and do not fracture across the grains. The conglomerate also includes interbedded reddish-brown arkosic sandstones and siltstones. Greenish-orange siltstones and sandstones are

found in outcrops in the immediate site vicinity (U.S. Army Corps of Engineers 1965). One portion of the unit, referred to as "millstone grit" (Wilson and Carpenter 1975:12), is a firmly cemented quartz conglomerate consisting of subrounded quartz pebbles and less abundant tuff fragments embedded in a silica-cemented dark-yellowish sandstone matrix.

Overlying the basal conglomerates are medium to coarse-grained arkosic sandstone, fine-medium-grained crossbedded sandstone and lenticular beds of claystone, siltstone and fine-grained sandstone. The latter beds are made up of quartz, clay minerals, sericite, chlorite, and iron oxides. The arkosic sandstones feature rock fragment inclusions locally cemented by calcite or silica (Wilson and Carpenter 1975:12).

It is possible that most of this formation was fluviially deposited by streams draining from the southeast. In this case it is probable that the Pekin Formation tends to become thicker and coarser-grained towards the southeast.

Post-Triassic deposits include the "residual Tertiary soils" — mechanically weathered and decomposed meta-volcanics (U.S. Army Corps of Engineers 1965:12) — as well as reworked fluvial and colluvial sediments, referred to as Holocene alluvium. Colluvium often occurs as "high level surficial sand and gravel deposits" along the southeast border of the Triassic Basin and in the alluvial terraces of the Deep and Haw rivers (Reinemund 1955:64). Colluvium and slope wash accumulations are more common southwest of the dam site area.

As discussed earlier the Tertiary meta-volcanic rocks generally weather to clay-rich sediments with variable sand and silt content. The clays are often quite plastic, but the consistency of the end products represents rates and factors of decomposition of the parent material. In the Haw River site area the meta-volcanics weather to finer clays; the density of such soils ranges from medium to high, generally without sharp contact between the unconsolidated matrix and the rock. The soil permeability is very low. Soils developed over Triassic sedimentary rocks are only slightly plastic, often with silt and occasionally with gravel components. Their densities range from medium to high, with variable permeability.

Fluvial clastics and Late Quaternary alluvium were deposited by the Haw River on a bedrock surface. The west bank features only intermittent alluvial pockets that are highly localized and poorly defined. Thicknesses may attain 20 feet, but this depth is exceptional. Studies of local boring logs have shown that the composition of the alluvium may be highly heterogeneous, but fine-grained particles (silty-clays and clay silts) constitute more than two-thirds of the sediment load (U.S. Army Corps of Engineers 1965:14). On the east side of the Haw River several cores revealed accumulations of clayey sands and deposits of river boulders, quartz pebbles, and gravels mixed in with the sands grading to the top of the profile. These sedimentation patterns may bear significantly on paleo-channel morphology and are potentially associated with river regimes in prehistoric times as discussed below.

Excessive volumes of water frequently rework the surficial sands and clays of earlier alluvium as the rapid runoff from the Piedmont generates periodic changes in floodplain morphology. The broadening of the floodplain south of the Haw River site area and along the Coastal Plain reflects these changes in the form of a dynamic topographic gradient.

The above discussion suggests that the post-Tertiary stratigraphy and geo-chronology of the Haw River sequence remains somewhat problematic. For example, deposits referred to by Reinemund (1955:61ff) as "high level surficial sands and gravels" appear to include both Holocene alluvial fills as well as earlier eroded terrace sediments. The sedimentary origins of the coarser phases of the formation may have been contributed by an earlier Pleistocene channel of the Haw-Cape Fear system, but establishing an absolute chronology is difficult since these are the only regional deposits resting unconformably over the Triassic rocks. Present evidence does not permit reconstruction and dating of the erosional history of the Triassic Basin. At best it may be argued that the extensive disposition of the clastics along erosional surfaces sloping parallel to the present landscape points to a relatively late time frame.

Geomorphology

The following section on geomorphology examines the nature and distribution of the unconsolidated surficial deposits constituting the contemporary regional terrain along the lower Haw River drainage. Geomorphic process is discussed as a time-dependent variable, dynamically altering landscape equilibrium over the course of the late Quaternary. Variability in landform configuration and process has largely determined the succession of pre-historic landscapes in the Piedmont over the past 12,000 years.

Of specific concern in the Haw River study are the landforms and changing fluvial systems of the floodplain microenvironments in which the earliest regional cultures evolved. Since the scale applied here is regional rather than local, the focus is on a broad spectrum of environmental factors acting on catchments and geomorphic systems rather than on particular landforms. It is, of course, the regional catchments and drainages that delineate prehistoric subsistence environments. In the Piedmont, as elsewhere, the intensity and nature of aboriginal subsistence was governed largely by the availability and accessibility of fresh water as a life-giving resource and center of biotic, and by extension, human activity. The present geomorphic settings relate specifically to prehistoric subsistence-settlement systems of the Piedmont riverine region. The concern of Piedmont archeologists with riparian microenvironments is underscored in Coe's (1964) regional synthesis of Piedmont prehistory in which he stresses the diagnostic potential of alluvial sites for understanding spatio-temporal trends in the Piedmont sequence.

Innovative geoarcheological techniques developed and applied during the Haw River project assess the diagnostic potential of these floodplain sites (see Chapter 6). The present section discusses the processes and general history of landform development along the catchment.

Pre-Quaternary Geomorphic History and Landscape Evolution

The geomorphic development in the study area is a reflection of the post-Triassic processes that have sculpted the terrain along the boundary of the Piedmont Plateau and the Coastal Plain. Regionally, the Piedmont Plateau features surface developed on both Triassic sediments (Triassic Lowland) and on upland (Piedmont Upland) of pre-Triassic igneous and metamorphic rocks. The Coastal Plain is an upland surface underlain by post-Triassic deposits. In general terms, the natural settings are the products of sedimentary regimes that have acted on these physiographic provinces, resulting in a succession of terrains.

Conceptually the integrated geomorphic history of the Piedmont Upland and the Coastal Plain may be viewed in terms of cycles of erosion, reduction and stabilization of upland surfaces that inter-fringed with a series of laterally deposited and eroded littoral deposits. Reinemund (1955:85) argues that the Piedmont is an ancient peneplain, truncating Triassic sediments and structures, thereby postdating them. The surface predates the surficial inner-edge Coastal Plain deposits (Pliocene?) since it passes under them. It is possible that the peneplain overlies the Tuscaloosa beds of Cretaceous-age which are an earlier series of littoral sediments, and, if this is true, then the peneplain itself would be post-Cretaceous. Clearly the peneplain was developed prior to Pliocene times and it is necessary to carefully date these higher-level deposits to determine how recent the period of stabilization was.

If the lower Coastal Plain formations are Cretaceous in age, they probably encroached westward and covered the Deep River Basin, to be subsequently eroded and then covered by later deposits. The Cape Fear, Haw, and Deep River channels were probably created as consequent streams on the Cretaceous formations and were draining their present courses by the time the high-level deposits were accumulating (Reinemund 1955:85ff). Subsequent and secondary tributaries incised their channels into this fill and then fed into the established higher order drainages.

The removal of the Coastal Plain deposits, especially the less resistant Triassic rocks, was associated with a general lowering of the base level and an acceleration of erosional processes continuing through Pliocene times. This erosion produced a Triassic lowland with a drainage system adjusted to structural features (i.e., joints and faults). While the principal streams flow southeastward, the Deep River course is uniquely perpendicular to the regional slope of Piedmont Plateau in its lower course. The northeasterly direction of flow may attest to a former drainage pattern initiated by a tributary of the Cape Fear that diverted the channel eastward instead of southward toward the ocean.

Fluvial Process and Late Quaternary Drainage History

It is clear from the above discussion that drainage variability within well differentiated Piedmont settings is a key to understanding Late Quaternary floodplain history. Distinct flow and channel patterns are linked with the physiographic sub-regions.

In the Piedmont Upland proper the major streams are entrenched up to 150 feet with tributaries cutting steep and narrow valleys as well. This surface runs west from the Deep River basin to the foot of the Blue Ridge Mountains in western North Carolina, rising by 250 feet. To the east the surface passes beneath the Coastal Plain. While most of the streams in the Piedmont Upland follow gradients paralleling the underlying rock structure forming dendritic drainage patterns, this is not true of the stream flow in the Triassic Lowland where meandering fluvial regimes are more prevalent and the drainage network is rectangular (i.e., trellis-like).

Elevations along the Coastal Plain/uplands border range from 100 to 200 feet above those of the Triassic lowland. Topography is undulating with smooth rounded interfluvies and flat-bottomed valleys with a regional slope to the southeast. Landscape irregularities reflect heterogeneous distributions of the poorly consolidated Coastal Plain deposits. Consequently, drainage networks are locally variable, but generally form dendritic drainage patterns.

Finally, it is noted that the distinctive falls and rapids of the Fall Line continue several miles southeast of the Piedmont along the Cape Fear River, limiting the erosive force of the stream at the Piedmont/Coastal Plain transition.

Geomorphic evidence for significant hydrological changes and periodicity over the course of the Late Quaternary is provided by the four level terrace system along the Deep, Haw, and Cape Fear rivers. Within the survey area fluvio-clastics underlie the four terrace levels and their sedimentary histories are linked to periodic channel adjustments and attendant flood regimes. Variable stream competencies and sediment carrying capacities resulted in differential cut and fill episodes in the excavated river valleys (see discussion below and in Chapter 6).

While four Quaternary terrace levels have been recognized, three (T_1 , T_2 and T_3) are well exposed along the Haw River near the prehistoric sites. The differentiation between terraces T_2 and T_3 is sometimes difficult to establish on topographic as well as lithostratigraphic grounds (see Figure 6.2). Former reconstructions (Reinemund 1955; Stephenson 1912) attributed the general sequence of terrace formation to four episodes of cut and fill activity in the major valleys, with episodes of aggradation tied to eustatic rises in sea level, occurring during Pleistocene interglacials. Similarly intervals of incision were correlated with glacio-eustatic lowering of the sea. Recent research in fluvial geomorphology has suggested that interpretations of alluvial deposits of the coastal segments of larger rivers is a complex problem not easily resolved by glacio-eustatic and/or base level arguments (Leopold, Wolman and Miller 1964; Wolstedt 1960; Schumm 1968). Alluvial cycles along the Deep and Haw Rivers, as elsewhere, reflect complex ecological readjustments involving channel and floodplain geometry, differential rainfall intensity and periodicity, as well as runoff patterns, ground cover and stream competence and capacity. Accordingly, the correlation of the river terraces in the study area remains a difficult problem (see discussion in Chapter 6). It is, nevertheless, probable that the distribution of the terraces within the Triassic belt

indicates that the belt formed a depositional trough when the alluvial cycles were initiated. Basal contacts across the terraces show that river channels within the mapped area have not been lowered more than 50 to 75 feet — occasionally to bedrock — since aggradation began (Reinemund 1955).

Summarily, former investigations have shown that while distinctive cut and fill episodes produced the various floodplain levels presently occurring as terrace outcrops, their depositional histories remain incompletely understood. It should be possible to establish, however, Pleistocene dates for the T₁, T₂ and T₃ terraces. A more detailed discussion of terrace stratigraphy, sedimentology and morphology based on the geoarcheological reconstructions at 31Ch8 and 31Ch29 is presented in Chapter 6. Evidence supports a strong case for placing the aggradation phases of the T₂ and T₃ terraces prior to 12,000 years ago.

SUMMARY: GEOLOGIC AND GEOMORPHIC HISTORY

The structural, stratigraphic and geomorphic observations presented above allow a provisional synthesis of the geologic history of the Haw River site area.

Late Triassic structural disturbances were largely responsible for the hilly and mountainous landscapes and the establishment of through-flowing drainage lines. Subsequent erosion wore down the mountainous topography and created a planation surface. Protracted peneplanation followed during the long (Jurassic/early Cretaceous) interval of structural stability. By the early Cretaceous the Deep River Basin assumed its present extent.

In the early Tertiary major orogenesis in the Appalachian region resulted in westward uplift and concomitant eastward tilting of the Cretaceous peneplain. Later in the Cretaceous marine transgressions deposited marine sediments on the continental margin which were periodically capped by debris eroding from the downslope of the structurally active Appalachian highlands. During the Tertiary erosional intervals alternated with major depositions in the Deep River region and base levels were continually changing due to composite effects of eustasy, tectonic activity and warping along the Coastal Plain.

By the Pliocene, erosion was dominant, effectively denuding upland surfaces and fashioning the drainage pattern. The general outlines of the contemporary topography, including the irregular and rugged Piedmont landscape and the Deep River lowland, were established at this time. Alluviation of coarse sediments (sands and gravels) in the Deep River area is thought to be a response to an essentially modern morphodynamic fluvial system that was initiated by Late Pliocene times (Reinemund 1955:87) or perhaps even later, during the Pleistocene. The geomorphology and stratigraphy of the Plio-Pleistocene remains the most problematic interval in the composite geological picture. The Late Pleistocene and Holocene geomorphic history, formerly included in this problematic association, comprises the theme for Chapter 6.

CHAPTER 6

GEOARCHEOLOGY OF THE HAW RIVER

INTRODUCTION

Joffre Coe's (1964) archeological studies have singularly demonstrated the unique stratified preservation of artifacts within alluvial deposits in the North Carolina Piedmont. At the Hardaway and Doerschuk sites on the Yadkin River, and the Gaston site on the Roanoke River, Coe found classic examples of deeply buried Archaic artifact assemblages. Each of these three sites provided stratigraphic separation and temporal definition to delineate and group artifacts once known only from surface collections. In the same study, Coe correctly argued that the occurrence of stratified archeological evidence at the eastern edge of the Piedmont Plateau was related to the complex geomorphology and geologic structure of the area.

The Yadkin River drainage basin collects surface runoff from a relatively great area, but as the river passes through the Piedmont this runoff is channeled through a narrow channel incised into the metavolcanic and metamorphic rocks of the Carolina State Belt. Coe suggested that the restricted channels of the Piedmont provided obstructions to water flow. Finger-like projections of rock along such restricted channels were considered to form eddies which Coe related to the deposition of sediment along narrow floodplains. This sedimentation in turn resulted in the rapid burial of archeological materials at such depositional environments along the river. In addition, Coe suggested that the narrow river channels of the Carolina Slate Belt were being actively incised into the underlying rocks while the floodplains of the Coastal Plain were aggrading, implying that the alluvial deposits of the Coastal Plain were relatively young and constantly reworked by lateral migration of active meanders. In the Piedmont, on the other hand, steady incision allowed preservation of the narrow floodplains and limited sinuosity as the river continued to cut more deeply into the underlying rocks. In retrospect, this review was an oversimplification of geomorphic theory which saw rivers to be actively eroding their headwater divides while depositing this same sediment along the lower courses of the valley (Gilbert 1902; Salisbury 1907; Butzer 1976). We now recognize that their processes are far more complex and in fact include repeated intervals of erosion and deposition through the length of the river system.

This geoarcheological study attempts to place Coe's original ideas and explanations in a more rigorous framework. At this writing, it appears that there has been little attempt in the literature to expand upon the types of generalities discussed by Coe. What are clearly lacking in archeological studies of the Piedmont are more detailed assessments of the geomorphology and geoarcheology. The excavation of Sites 31Ch8 and 31Ch29 in association with the B. Everett Jordan Reservoir project has provided this opportunity. Figure 3.2 shows the project area along the Haw River and its location in comparison with Coe's classic

Piedmont sites on the Yadkin and Roanoke Rivers. It can be seen quite clearly that all three areas occupy similar positions at the eastern edge of the Piedmont Plateau. For this reason, the Haw River sites studied in this report are considered to be representative of the types of depositional environments discussed in a general way by Coe. Perhaps the closest analog to the Haw River location is Coe's Doerschuk site on the Yadkin River. Both site areas are located: (1) on the eastern edge of the Carolina Slate Belt; (2) near the mouths of the narrow incised channels of their respective rivers as they leave the Slate Belt, and (3) at a pronounced change in river gradient from steep to gentle along the longitudinal profile of the rivers as they leave the Piedmont and enter the lowlands of the Coastal Plain.

Such locations are highly significant depositional environments. While Coe attributed his finds of deep archeological stratigraphy at the Doerschuk site to good luck, it can be readily seen that this environmental setting is a depositional basin and the focus of rapid floodplain occupation. Such sedimentary basins normally occur with major changes in stream velocity for the rivers of the Piedmont. Rapid deceleration of stream velocity from the probable turbulent flow of the steep and narrow river channels of the Piedmont to the more nearly laminar flow of the low gradient Coastal Plain rivers results in limited transportability of sediment load. At both the Doerschuk and Haw River sites, episodic flooding left thick sequences of predominantly fine grained sands. These in turn contain the archeological record of Late Pleistocene and Holocene aboriginal occupations.

It has not been the narrowness of a floodplain near the "Fall Line" in the Carolina Piedmont that has been significant in limiting the range of aboriginal occupations as Coe proposed (1964). In the case of the Haw River sites, for example, lithic debris is found at least 1 km away from the main channel and the modern floodplain. Similar alluvial depositional settings should be anticipated for other areas of the Piedmont as well. The most important geoarcheological point addressed by our studies and by inference, those of Coe, is that deeply buried archeological sites are more likely to occur in depositional basins rather than on upland erosional surfaces. While this seems to be an overly simplistic statement, it has major implications for archeological studies in this region. For example, many researchers examining Early Archaic archeological problems have adopted Coe's presumably diagnostic fall line-valley model to locate other deeply buried sites (c.f. Chapman 1975, 1977, 1978; Broyles 1971). This model has been an effective locational tool. In addition, it has aided in the location of many important Archaic sites which have provided more secure dating of lithic artifact assemblages and the cultural adaptations they represent. Simultaneously, however, reliance on this model has tended to bias our choices of archeological site excavation. We should be constantly aware that we are, by this technique, consciously selecting for archeological data sets based upon depositional rather than cultural criteria.

For these reasons, our study attempts to place the excavated sites 31Ch8 and 31Ch29 in a detailed geoarcheological context which has been lacking in earlier studies. In this way we hope to provide a basis upon which new interpretations of Carolina Piedmont archeological research can be founded. At the same time, we wish to provide a geoarcheological overview of the Haw River that will apprise later archeological researchers of the geological

complexities of the region and encourage them to conduct similar in-depth studies within the Carolina Piedmont. The geoarcheological study presented here should not be used cavalierly as a new model to replace Coe's. This defeats our purpose. Rather, the concepts and methodology should be explored to improve future and ongoing studies of similar scope and importance.

GEOLOGIC BACKGROUND

The portion of Haw River Valley to be flooded by the B. Everett Jordan Reservoir is not adequately described as a fall zone transition location. Rather the geographic relationships are more complex. Reinemund (1955:85), for example, points out that the Fall Line is actually located several miles east of this location. As discussed in Chapter 5, the area to be flooded by the reservoir lies within the Deep River Triassic Basin (Reinemund 1955). This is a structural and topographic trough filled with Triassic sandstones, silt-stones, and conglomerates, bounded on the west, north and east by pre-Triassic igneous and metamorphic rocks of the Piedmont Plateau. The Basin is characterized by faulting. Two systems of normal faults have divided the Basin in discordant fault blocks. The dominant system of normal faults consists of northeast-trending faults which transect the Basin longitudinally. Northwest-trending cross faults add a subordinate system of discontinuous normal faults. These create a rectangular fault framework produced by the intersection of the two systems.

In addition to the geological and structural relations created by these faults systems, cross faults were frequently followed by the subsequent intrusion of diabase dikes. Reinemund notes that "many springs originate by movement of groundwater along the margins of these intrusions" and adds that in historic times "local inhabitants have learned by experience that dikes are favorable locations for water wells" (Reinemund 1955:60). This situation may have conditioned aboriginal use of the area as well.

Figure 3.1 is an extrapolation of Reinemund's (1955) well-defined fault systems for the area near Moncure, North Carolina. Unfortunately, detailed mapping of the local geologic structure did not extend north of Moncure. Examination of recent aerial photographs, however, has allowed the identification of conspicuous lineaments which conform closely to the northeast and northwest trends of the major normal faults of the area. This allows the tentative identification of the most intensively faulted portions of the proposed reservoir. The western edge of the Triassic basin is apparently bounded by the Indian Creek Fault Zone. The zone is marked by a remarkably straight fault. Its trace is delineated by a belt of greatly disarranged rocks. Figure 6.1 shows that this fault zone most probably crosses the Haw River below sites 31Ch8 and 31Ch29 and continues northeastward into the more extensive floodplain of the New Hope River Valley. Further to the southeast, the Deep River Fault is extrapolated across the Haw River near the B. Everett Jordan dam site. The visible lineaments shown in this area, in combination with topography, show this area to be cut by several northeast-trending faults which are a northern extension of a zone of similarly observed faults shown by Reinemund (1955) at Moncure. Here, normal faulting has affected the base of the Triassic Pekin Formation and the pre-Triassic metavolcanic rocks to the

north. Differential movement along these faults has resulted in a series of discontinuous ridges underlain by resistant metavolcanic rocks interspersed between lowlands and valleys underlain by the siltstones and sandstones of the Pekin Formation. The dam site for example, has been constructed upon a fault-bounded block of pre-Triassic metavolcanic rocks, while the adjacent valley of the New Hope River occupies a trough eroded into the less resistant siltstones of the Pekin Formation.

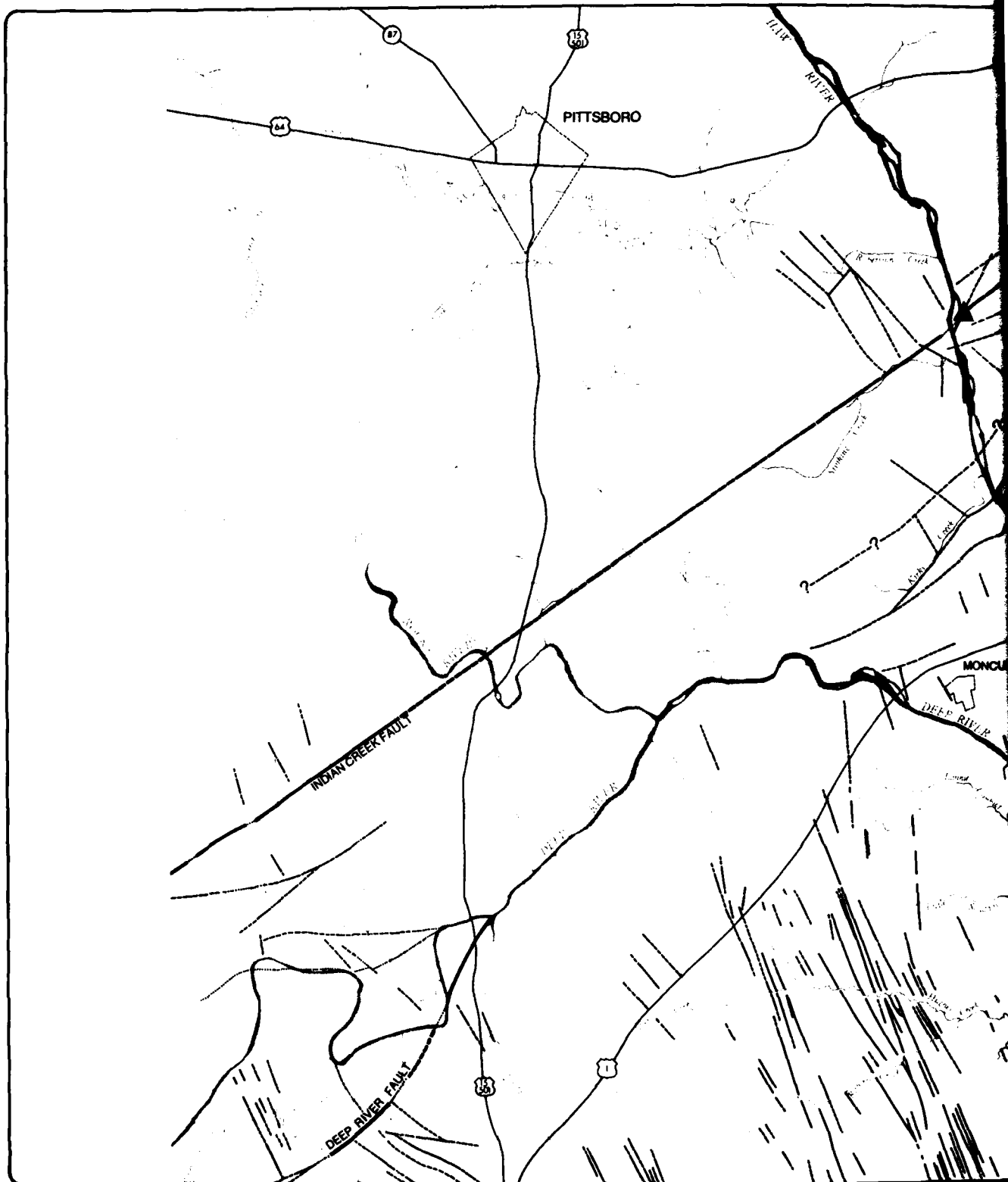
The resultant topography is often marked by seemingly erratic ridges and valleys which lack a regional trend. Upon closer inspection, the intensively faulted fabric of the project area creates numerous depositional basins transected by the major rivers and streams. The Haw River floodplain at 31Ch8 and 31Ch29 is one such basin. Complex faulting along the Indian Creek Fault Zone has given rise to an isolated basin which receives the direct runoff and rapid sedimentation of the Haw River.

Figure 6.2 is a profile along the Haw River from U.S. Highway 64 east of Pittsboro to U.S. Highway 1 near Moncure. The profile shows clearly the areal relationship between normal faulting and topography. Structural relationships and the composition of the rocks produced a relatively dissected and rugged terrain, while thin wedges of the more easily eroded Pekin Formation, bracketed by faults, were left as discontinuous basins. Figure 6.2 illustrates a hypothetical system of faulting based upon Reinemund's (1955) studies of the Moncure area as well as photointerpretation of recent aerial photographs of the project area. Depicted faults, while not located in the field, display patterns consistent with observed cases in the Haw River Valley and should be used as a guide for future work in this area.


The plan view of Figure 6.2 emphasizes the isolated nature of the floodplain at sites 31Ch8 and 31Ch29. Quaternary alluvial sediments, for example, cover only a limited floodplain area of 1.5 km by 1.0 km. The Haw River continues south and is incised into a second ridge of metavolcanic rocks which again restricts its channel. The Deep River Fault Zone is encountered along the valley of the New Hope River, and functions as an additional but less extensive basin for deposition. A final ridge of resistant metavolcanic rocks completes the sequence of alternating ridges and basins. The narrow incised channel of the Haw River flowing through this final ridge was chosen as the site for the Jordan Reservoir dam. Foundation studies conducted by the U.S. Army Corps of Engineers (1965) delineate the extent of both upstream and downstream faulting as shown on Figure 6.2. Still further to the south, the Haw River enters the broader portion of the Deep River Basin which is underlain by thick sequences of the Pekin Formation. Surface relief south of the B. Everett Jordan Dam, is thus, much gentler than in the metavolcanic belts.

Alluvial Terraces of the Haw and Deep River Valleys

South of the B. Everett Jordan dam site, Reinemund (1955) mapped a series of Quaternary alluvial terraces along the Deep and Haw rivers near Moncure, North Carolina. Such raised terraces often cap the Triassic sediments in this area. While Reinemund mapped four terraces along the Deep River, only three were traced to the confluence with the Haw River. The originally mapped terraces are referred to as Terrace 1, Terrace 2, Terrace 3, and Terrace 4, in order of increasing elevation above the modern river channels.



DATA RECOVERY AT SITES 31CH29 & 31CH8
B. EVERETT JORDAN DAM & LAKE
CHATHAM COUNTY, NORTH CAROLINA

 COMMONWEALTH ASSOCIATES, INC.

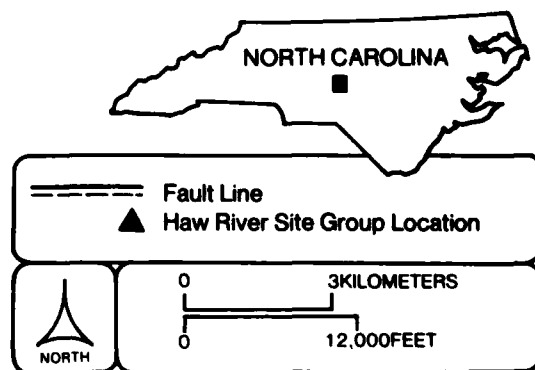
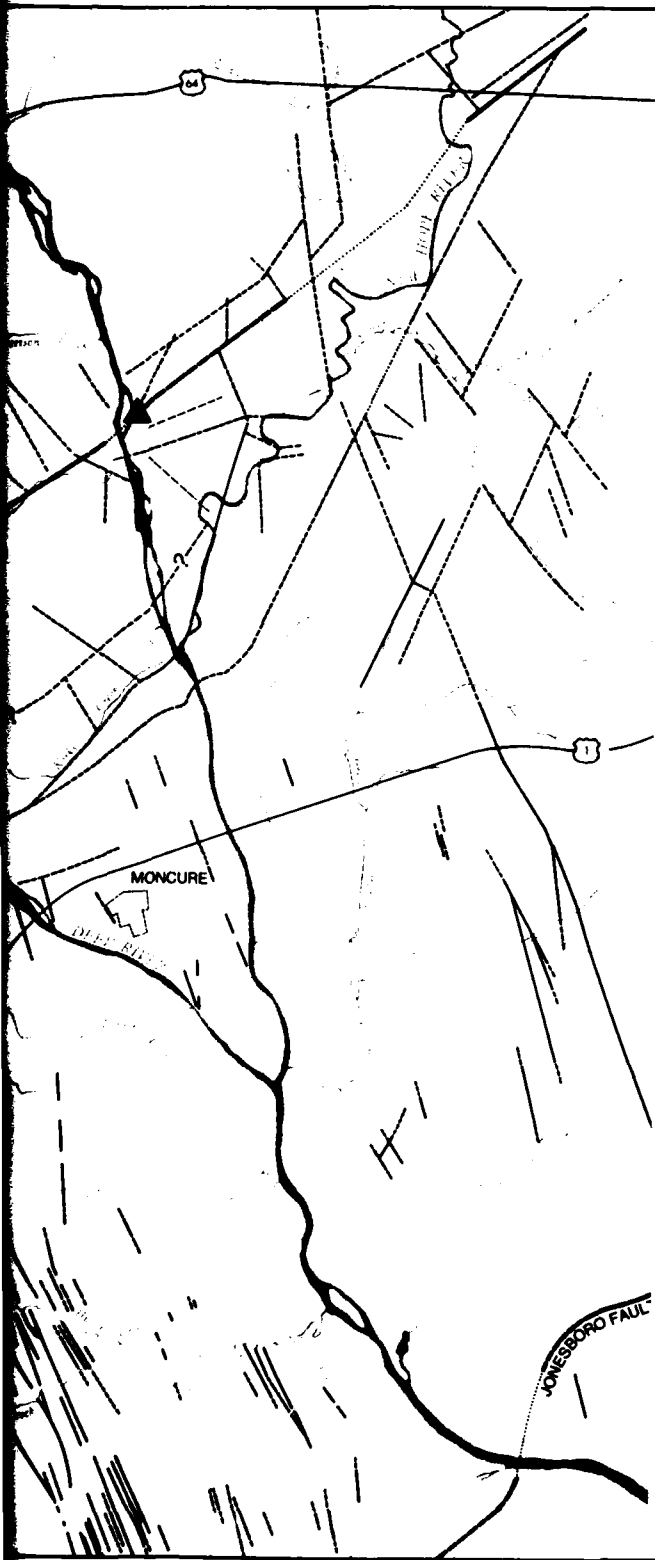
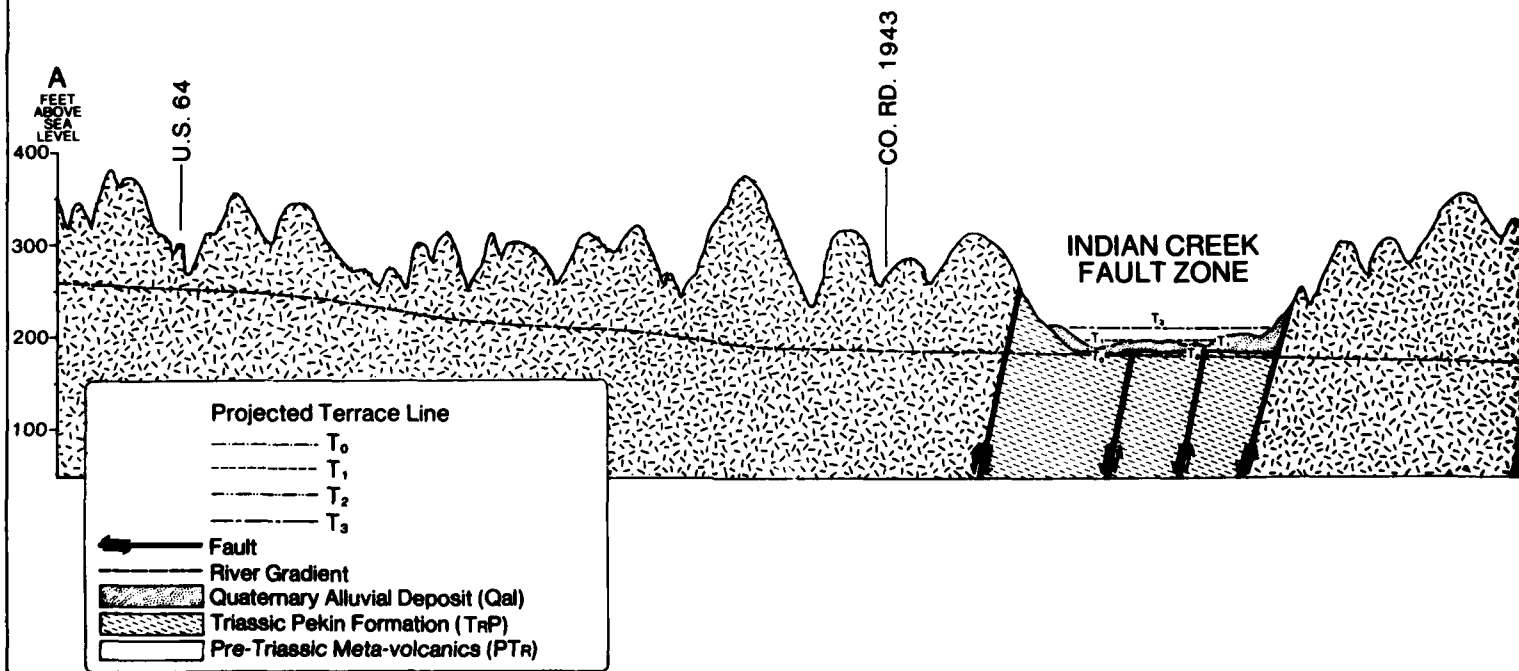
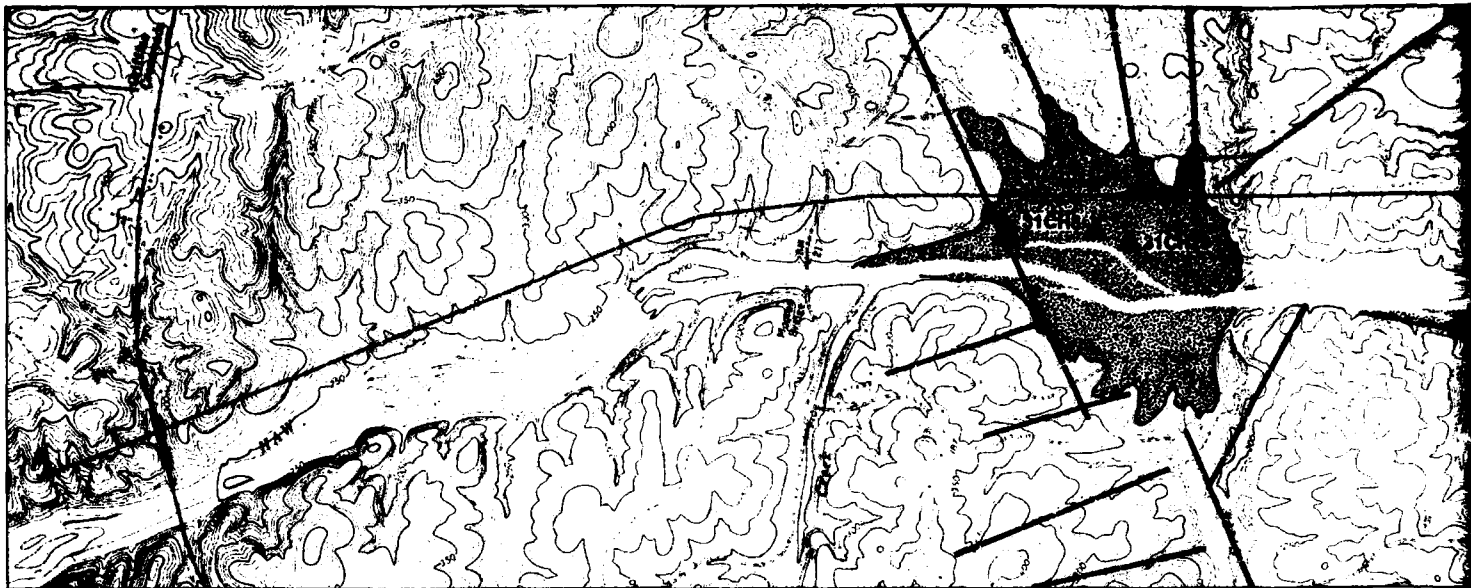
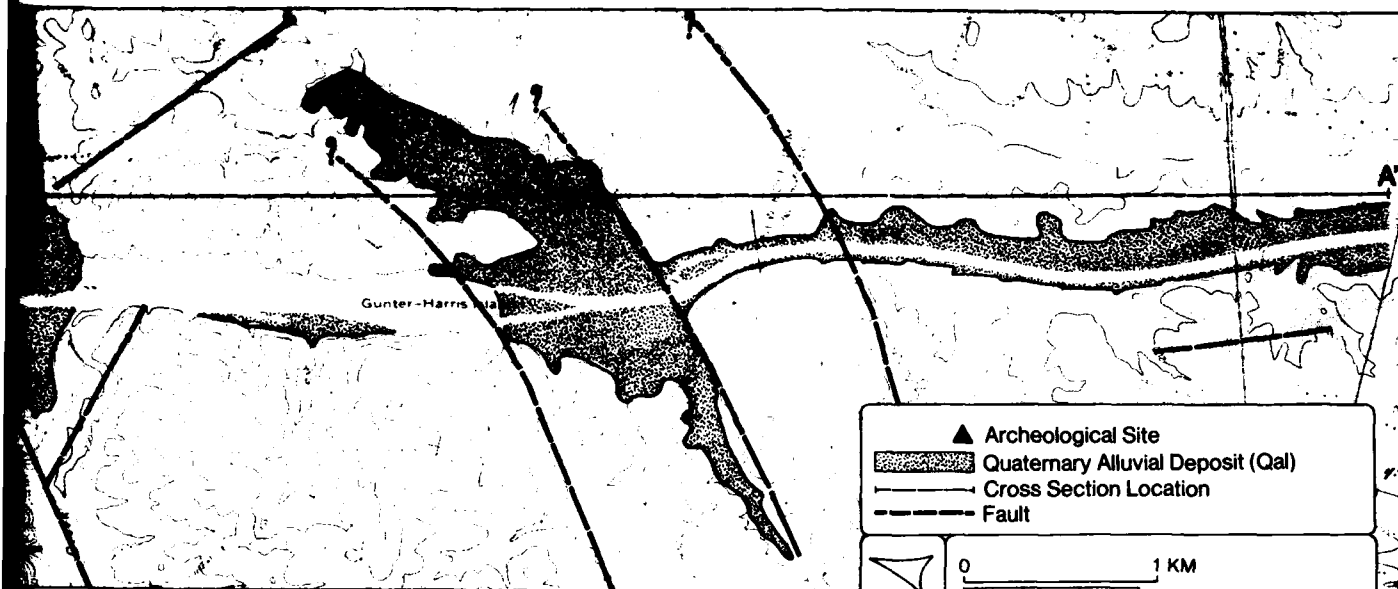


FIGURE 6.1
GEOLOGIC STRUCTURE-
DEEP RIVER & HAW RIVER VALLEYS

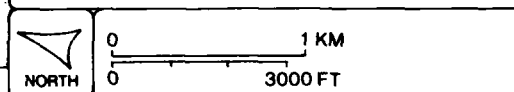
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DATA RECOVERY AT SITES 31CH29 & 31CH8
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- ▲ Archeological Site
- ▨ Quaternary Alluvial Deposit (Qal)
- - - Cross Section Location
- - - Fault



SOURCE:
USGS 1:24,000 Topographic Maps.

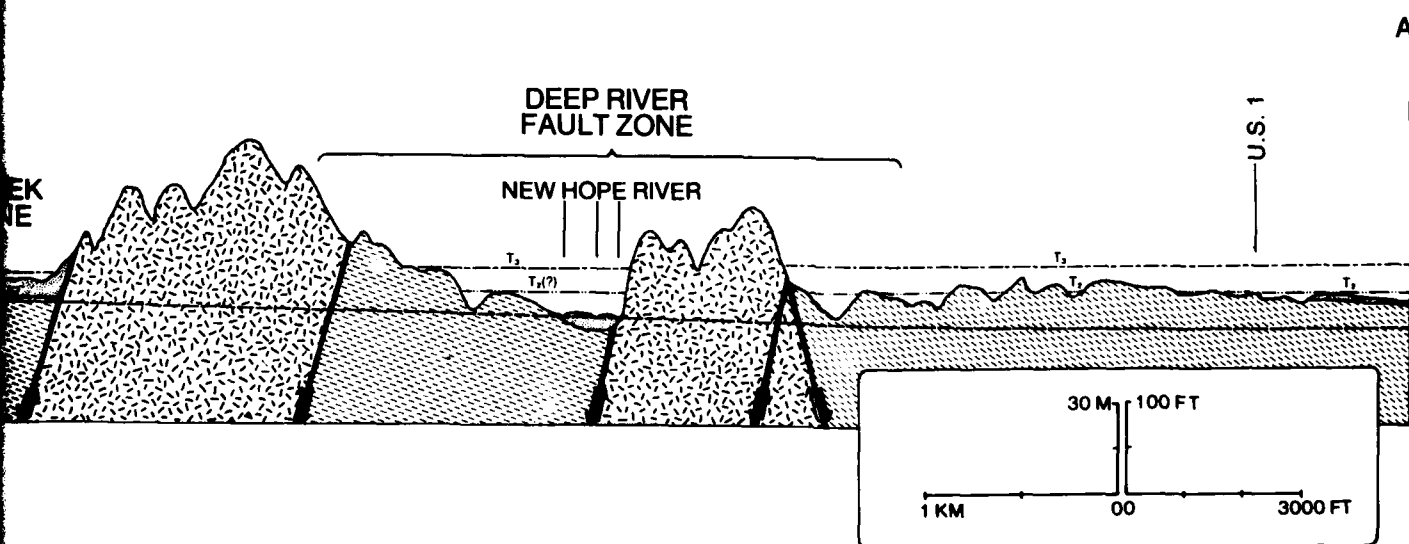


FIGURE 6.2
GEOLOGIC PROFILE-
HAW RIVER

2

Terrace 1 is located between 20 and 25 feet (6.1-7.6m) above the Haw River. This terrace is prominent only along the lower Deep River and the Haw River below Moncure, but extends upstream along the latter river for a few kilometers. The Terrace 1 surface is capped by light gray to light brown silty loam surface soils which have developed on a parent material of "light gray, yellow or brown plastic clay" (Reinemund 1955:66). When found in an undisturbed condition, the terrace surface may also be covered with a thin layer of fine white sand, except near the river where it is more often covered by recent silts and clay from modern overbank deposition. The relationship of Terrace 1 to modern flooding is also expressed by Reinemund who notes that outcrops of this terrace system can be recognized as "flat poorly-drained channel-like strips separating patches of the higher terraces" (Reinemund 1955:65). Such channel-like strips are often followed by distributaries of the rivers during flooding and may result from this type of water flow.

Terrace 2, on the other hand has a greater lateral distribution than Terrace 1. It is located between 35 and 45 feet (10.7-13.7m) above the Deep River, and can be traced upstream from the confluence of the Haw and Deep Rivers for a distance of approximately 80 km where it blends into the surrounding landscape. Deposits underlying Terrace 2 consist mainly of friable silts or sandy clays with subordinate amounts of sand and gravel present as discontinuous lenses. In areas where these terrace deposits have been extensively eroded, residual accumulations of pebbles and cobbles may appear. Most pebbles and cobbles are subangular to subrounded and are of white or gray quartz.

Terraces 3 and 4 are, respectively, 50 to 75 feet (15.2-22.9m) and 90 to 110 feet (27.4-33.5m) above the Deep River. Their composition is quite similar to Terrace 2 with sandy clay and silts predominating. As with Terrace 2, white quartz cobbles and pebbles are common as a lag deposit. These two terraces occur only sporadically in the project area.

Reinemund (1955:60) considers the four raised terraces to be Pleistocene in age. He believes each of the terraces indicate the approximate surfaces of four separate valley fills, resulting from the aggradation of the main and tributary river valleys. Because the three uppermost terraces appear to converge between 80 and 192 km upstream from Moncure, Reinemund has chosen to attribute these periods of aggradation to base level changes associated with fluctuations in sea level during the Pleistocene. Accordingly, each terrace level was thought to represent a high sea level stand with a river system graded to this base level. During periods of glaciation when world sea levels dropped below the present level, streams became incised as the system readjusted to a new and lower base level. Valley infilling and alluviation occurred again following glaciation, when sea levels rose once again. The picture presented is one of episodic periods of stream incision followed by subsequent valley alluviation. A reverse pattern is thought to have governed northern river systems, like the Ohio River, which experienced periods of major terrace development during glaciation when outwash streams to the north supplied increased sediment loads from nearby glacial fronts. In this case, the Ohio Valley was filled with valley deposits which dammed tributaries and caused ponding of streams behind these thick deposits (Kempton 1959).

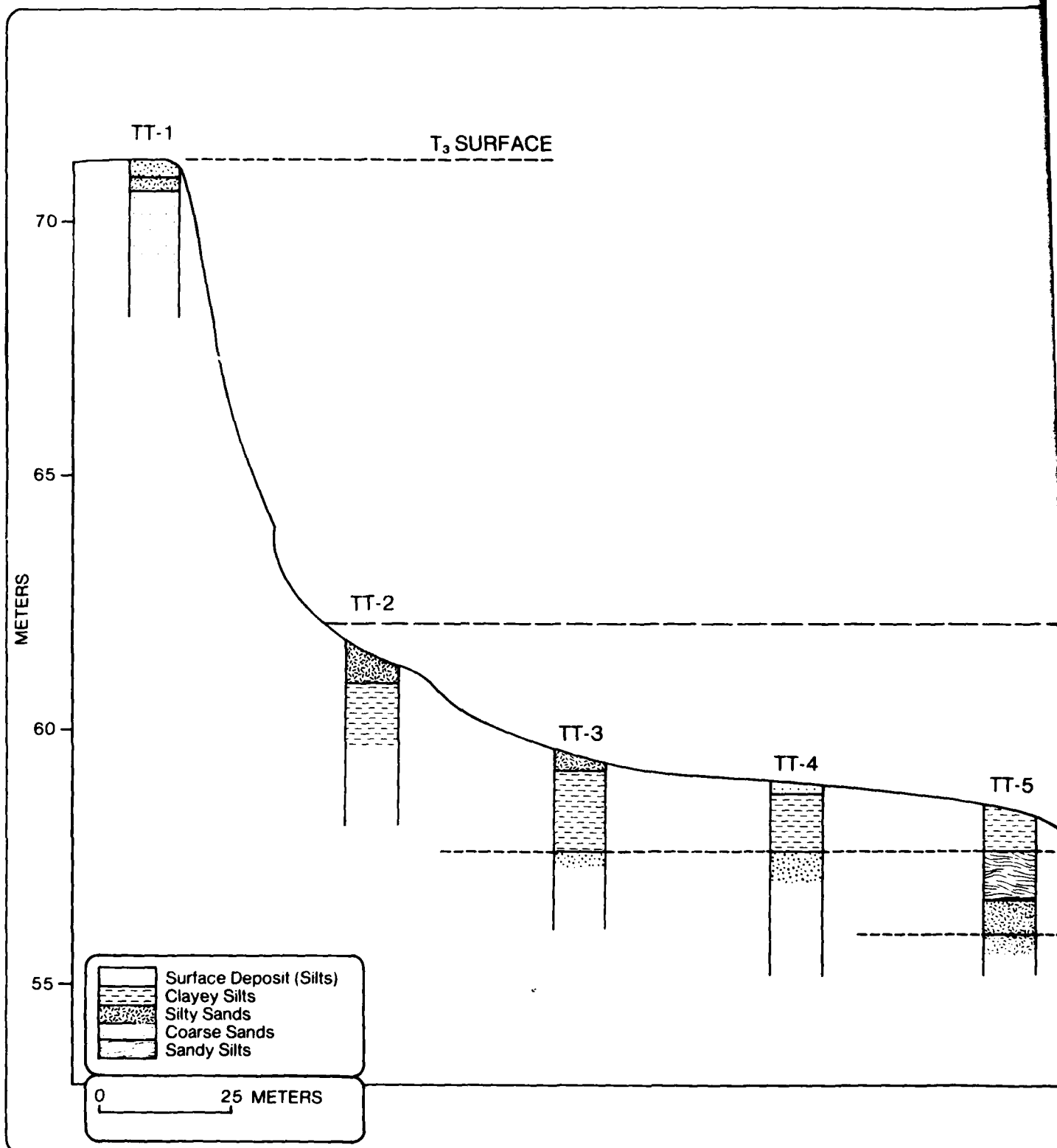
Reinemund suggests that many of the terrace deposits along the Deep River above Moncure may be explained by typical stream sedimentation. This observation should apply equally well to the Haw River. He notes, however that some of the more regularly bedded and better sorted sediments below Terrace 3 may be estuarine deposits. Terrace 1 which, as Reinemund notes, is largely underlain by tough plastic clays and is restricted to the valleys of the Haw and Cape Fear Rivers is more likely of estuarine origin; deposits may have accumulated in ponded water.

While each of the four Deep River terraces is suspected by Reinemund to correlate with marine terraces on the Carolina Coastal Plain, direct correlation is lacking. The absence of firm evidence suggests that the interior terrace system warrants a more detailed study in order to better understand the complex environmental factors which have influence in fluvial erosion and deposition patterns in this region.

The high alluvial terraces of the area present a possible explanation for the superposed drainage system of the region, indicated by the presence of meandering stream courses incised into both pre-Triassic and Triassic rocks. Reinemund (1955:87-88) suggests that this region was once covered by Cretaceous through Pleistocene high level sedimentary deposits. The Deep and Haw River courses were argued to have developed on this original Cretaceous age land surface. Following Reinemund's reasoning, Cretaceous rocks have since been removed by erosion leaving the main courses of these rivers superposed on the underlying rocks. These incised meander patterns, readily discernible on topographic maps, may equally well be related to the Pleistocene. For example, if Reinemund is correct in relating the various raised terraces to high interglacial sea levels, we should suspect the rivers of these preexisting floodplains to have meandered according to their contemporaneous stream regimes' underlying geologic deposits and structure. Progressive lowering of base levels throughout the Pleistocene as shown by alignments and configurations of the major terrace systems, is an alternative explanation for the lowering of preexisting Pleistocene stream patterns upon the underlying Triassic rocks. Regardless of the exact cause, these superposed streams are now partly adjusted to the regional geological fabric of easily eroded strata, joints and faults. The incised meander patterns of such earlier streams are clearly anomalous geomorphic features which must be taken into account when considering the depositional patterns of Piedmont rivers.

Alluvial Terraces at Sites 31Ch8 and 31Ch29

Initial on-site geomorphological investigations of the Haw River floodplain near sites 31Ch8 and 31Ch29 were designed to provide two related types of information. The first was to determine the subsurface geology of alluvial land-forms in the area, while the second was to evaluate the archeological potential of buried strata in terms of age and human occupation. Deep testing of the floodplain area was utilized to satisfy both of these goals. Testing began with a series of backhoe trenches excavated along an east-west coordinate 350m. A geologic profile of the Haw River prepared from the subsurface data recovered from backhoe trenches is shown in Figure 6.3.



DATA RECOVERY AT SITES 31CH29 & 31CH8
B. EVERETT JORDAN DAM & LAKE
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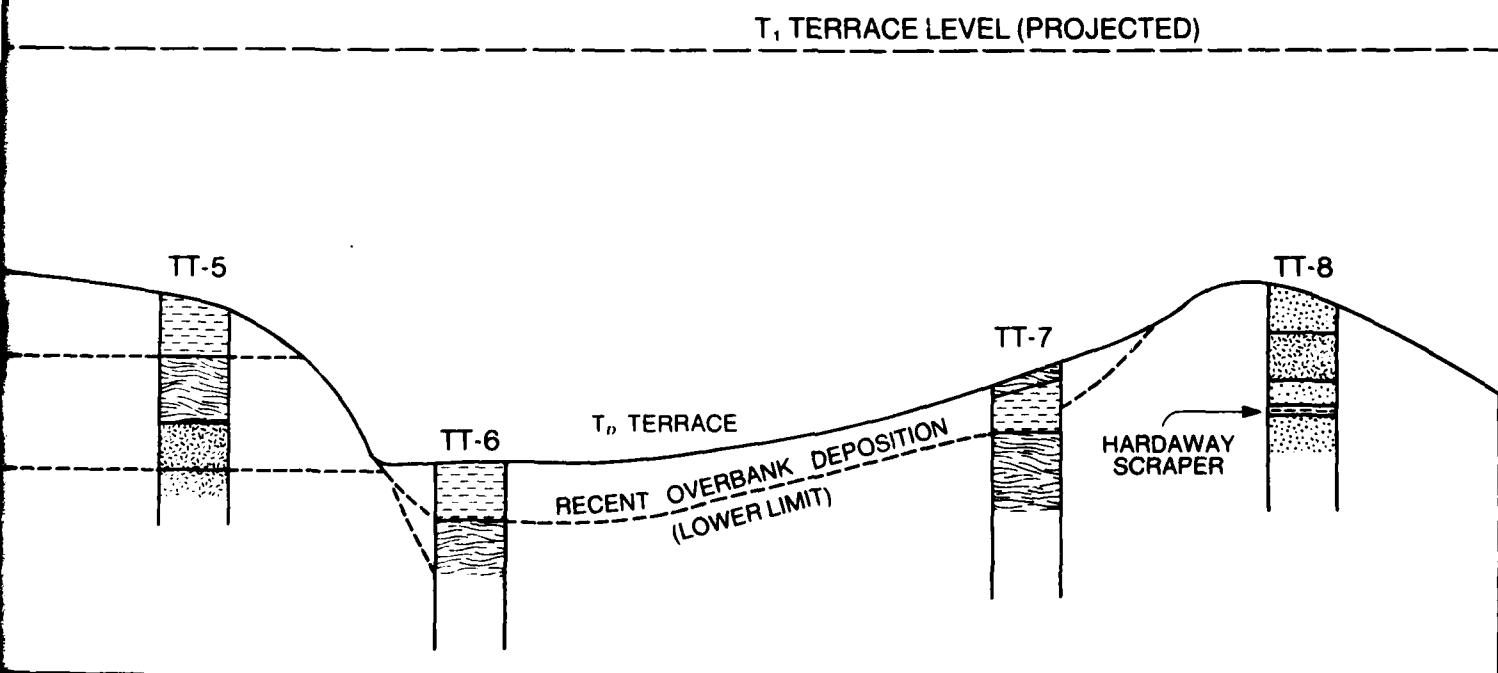


FIGURE 6.3
CROSS SECTION
HAW RIVER VALLEY
(THROUGH SITE 31CH8)

Test Trench 1 was located on the surface of a relatively high dissected alluvial terrace (T₃) at an elevation of 110m. This terrace is covered with a thin veneer of lithic artifacts, confined to the uppermost 5 to 10 cm of the terrace and incorporated in a matrix of brownish yellow medium to coarse grained sand which extends to a depth of 40 cm below the ground surface. Below this sand lies a brownish yellow, silty medium grained sand interbedded with thin dark red laminations. These laminations show an apparent eastward dip of 15° and indicate a post depositional displacement of this terrace by possible mass wasting processes. The subsoils beneath this terrace surface also show disruption of natural stratigraphy by tree roots.

The elevation of the T₃ terrace and its associated sedimentary sequence suggest that it is a northern extension of Reinemund's Terrace 2 which was indicated near the confluence of the Haw and Deep Rivers (Reinemund 1955 1:65-67). The edge of the T₃ terrace as defined here is truncated and slopes sharply to the west. A second test trench located 50m further west and at an approximate elevation of 100m marks the foot of the slope below the T₃ terrace.

Test Trench 2 showed a different sedimentary record. The stratigraphic sequence exposed at this location consists of 2m of brownish yellow to reddish brown clayey silt. Because of the consistently fine grain sizes throughout the sequence, these sediments were initially interpreted as evidence for ponding in the river valley and the existence of a Pleistocene lacustrine environment. Subsequent investigations, however, suggested that these sediments were quite similar to the estuarine deposits described by Reinemund (1955 1:65-67) as underlying his Terrace 1. The elevation of this trench is also on the order of that of the Terrace 1 which Reinemund mapped further downstream.

Fifty meters to the west, Test Trench 3 exposed a similar sedimentary sequence which showed 2m of brownish yellow clayey silt overlying a medium to coarse grained water bearing sand. These clayey silts are generally similar to those exposed in Test Trench 2 and also fit the description of the estuarine deposits of Reinemund Terrace 1 referenced above. Similar stratigraphy is also exposed in Test Trenches 4 and 5 further to the west. In each of these cases, water flow in the underlying sands caused rapid collapse of the trenches which prohibited sampling.

In general, the clayey silt deposits shown in Trenches 2 through 5 underlie a terrace surface between 97 and 100m in elevation. This terrace has been designated T₂ here. While subsurface clayey silt deposits of the T₂ terrace deposits potentially relate to the estuarine deposits of Reinemund's Terrace 1, it is also possible that the T₂ surface represents a later erosional platform on top of the Pleistocene estuarine deposits. Thus, it may not constitute a formal altitudinal correlate with Terrace 1.

Test Trench 6 was excavated into a marshy tract at the western edge of the T₂ terrace. This back swamp area floors an incised distributary channel of the Haw River; it is currently ponded by floodwaters during summer months. Fresh overbank deposition of silt covers this

low area following episodic inundations. The fine-textured underlying deposits reflect this modern depositional history, as the uppermost meter of this sequence consists of dark brown to brownish yellow clayey silts overlying a brownish yellow silty fine sand. The western edge of the distributary channel and associated back swamp is shown in Test Trench 7. Recent overbank deposition covers the surface of the channel and can be seen to lap onto a ridge of predominantly brownish yellow silty fine sand which also underlies Test Trench 6.

While no deeply buried artifacts or other evidence of prehistoric activities could be found in Trenches 1 through 7, circumstances changed markedly in Test Trench 8. There, for example, the stratigraphic sequence showed the floodplain to be underlain by brownish yellow fine sands which predated and underlay the back swamp deposits exposed in Trenches 6 and 7. Test Trench 8 marks the western flank of an eroded linear ridge which exhibits a planar surface 80m further to the south. That surface sets off a prominent alluvial level designated as part of the T₁ terrace system. Remnants of this terrace are found over much of the project area and can be identified across the area as discontinuous ridges with approximate surface elevations of 100m ASL.

At Trench 8, the stratigraphic sequence shows this segment of the T₁ terrace to be an alluvial fill composed predominantly of brownish-yellow silty fine to medium grained sand. This depositional pattern is disrupted intermittently by seemingly continuous layers of reddish brown silty fine sand. In Trench 8 these attained thicknesses of up to 5 cm. One such reddish brown silty fine sand layer at 1.8m below the surface yielded a steep edge-angled, unifacial tool of vein quartz analogous to specimens Coe (1964: 73-79) has found elsewhere in Early Archaic contexts. This "Hardaway scraper" presented the first buried archeological evidence at the site and offered a *provisional archeological date* for this portion of the alluvial fill at ca. 9,000-10,000 B.P.

Careful scraping of the walls of the trench showed that waste flakes occurred at various levels in the stratigraphic sequence, but frequently near reddish brown silty fine sand layers. At 60 cm below the surface at Trench 8, a paleosol was identified on the basis of a dark brown silty fine sand defining a buried "A" horizon. The same unit contained examples of prehistoric ceramics. The uppermost sediments at this location appear to have been re-deposited as 20 to 30 cm of brownish yellow medium grained sand, containing Middle Archaic Morrow Mountain and Halifax hafted bifaces which overlap the Woodland ceramics of the buried "A" horizon.

At this juncture, we propose five generalized stages in the development of the Haw River floodplain based upon interpretations of the test trenches. The earliest event is marked by the surface of the T₃ terrace which points to Pleistocene age alluviation of the Haw and Deep Rivers possibly related to higher interglacial sea levels which raised the base levels of contemporary streams (Reinemund 1955:86). Erosion of the T₃ terrace occurred and was followed by deposition of estuarine or lacustrine sediments represented by gray and brownish yellow clayey silts. This event possibly represents a subsequent high interglacial sea level stand as Reinemund suggests, but may also relate to an unidentified period of

ponding of the Haw and Deep River which gave rise to the formation of temporary Pleistocene lakes. Micropaleontological studies must be carried out on these sediments to verify their marine or lacustrine origin. In any event, deposition of estuarine or lacustrine sediments was followed by erosion and incision of the Haw River, perhaps in concert with the drop of interglacial high sea levels.

During terminal Pleistocene times and throughout the Early and Middle Holocene, the contemporary floodplain, including the depressions eroded into the estuarine deposits of the T₂ terrace, was covered with thick deposits of brownish yellow silty fine sand. These were fine sediments transported as suspended load during episodic flooding of the river and deposited rapidly at this location as the velocity and turbulence of the river water decreased due to a change in gradient at the Indian Creek Fault Zone. Deposition of these sands continued upward until a contemporary floodplain surface of ca. 100m above sea level was attained. This surface has been designated the T₁ terrace and probably once covered portions of the T₂ surface characterized by Pleistocene age estuarine deposits.

Incision of the river and its distributary channels evidently followed deposition of the T₂ alluvium. The artifacts at Trench 8 suggest that this incision and related erosion of the T₁ terrace probably occurred between the Woodland and Late Archaic occupations, however, subsequent detailed analyses of other portions of the site indicate that successive periods of incision may have recurred intermittently over the course of the Holocene.

Incised distributary channels such as that exposed between Trenches 6 and 7 have been filled with probable Late Holocene overbank clayey silts. Late Holocene incision continued eventually and resulted in abandonment of the above channel in favor of an additional distributary which marks the western edge of the project area and is shown on the plan view of the floodplain in Figure 6.2.

A change in stream regime provides an explanation for the events which provided sediment for formation of the T₁ alluvial fill and the subsequent incision of distributary channels. For example, medium to fine grained sands are no longer deposited on the modern floodplain. Rather, the suspended sediment which is associated with the lowermost terrace system, relative to the surface of the modern floodplain, is confined to silt and clay sizes. Such a variation indicates possible changes in runoff and/or sediment supply in the Haw River drainage basin. The generalized depositional history of the floodplain is summarized in Table 6.1.

The generalized alluvial history of the Haw River floodplain as interpreted in this investigation of terrace remnants and their subsurface stratigraphic records indicates a varied pattern of alluviation. Central to this study is the suggestion of variation in Holocene depositional patterns in this region. The pattern suggested from the data examined here is one of deposition of fine sands and concomitant aggradation to the level of the T₁ terrace surface during the Early and Middle Holocene. This period was followed by Late Holocene stream incision and a change in sediment load from fine sands to clayey silts. Such a change

TABLE 6.1

**GENERALIZED DEPOSITIONAL HISTORY OF THE
HAW RIVER FLOODPLAIN**

- | | |
|--|---|
| <p>1. Middle Pleistocene:
T₃ Terrace
(Reinemund Terrace 2)</p> | <p>Deposition of sands and silty sands filled the valley and gave rise to the surface of the T₃ terrace at ca. 13m above the Haw River. This depositional sequence was followed by erosion and incision of the Haw River.</p> |
| <p>2. Late Pleistocene?:
T₂ Terrace
(Reinemund Terrace 1)</p> | <p>Deposition of estuarine or lacustrine clayey silts near the confluence of the Haw River to form a T₂ terrace surface at ca. 8m above the present channel levels of these rivers. Subsequent erosion and incision of the Haw River left relict channels that were subsequently filled with Holocene colluvium.</p> |
| <p>3. Terminal Pleistocene-
Middle Holocene
T₁ Terrace
(10,000-3000 B.P.)</p> | <p>Deposition of a thick fill of silty fine sands to form the T₁ surface of the terrace approximately 10m above the bed of the Haw River at site 31Ch29. This deposit filled former channels incised into earlier T₂ terrace deposits and probably covered portions of the T₂ terrace.</p> |
| <p>4. Late Holocene
(3000-1000 B.P.)</p> | <p>Incision of the Haw River into the T₁ terrace system. This period relates to lateral erosion of the T₂ alluvial fill and formation of linear distributary channels and subsequent sloughs on the floodplain.</p> |

**5. Late Holocene
(1000-B.P.-present)**

Infilling of distributary channels with overbank deposits of clayey silt forming the T₀ terrace system. Late Holocene sedimentation indicates a different stream regime and/or source and composition than in Early and Middle Holocene.

in the regime of the Haw River suggests significant variations in the Holocene environmental conditions in the Carolina Piedmont — a condition that has not received emphasis in recent archeological studies of the area.

Coe (1964:11) felt that rivers of the Carolina Piedmont were being actively incised rather than undergoing aggradation. At the same time he argued that aggradation was occurring in specific microdepositional situations such as those produced by large eddies near projecting rocks. While Coe's intent was to relate depositional environments to a temporary reduction in stream velocity, he did not adequately consider the mechanisms by which an actively eroding stream was able to build progressively higher floodplain levels during the Holocene at one location, while eroding more deeply into the underlying rocks in others.

The profile in Figure 6.3 clarifies this problem at the Haw River sites. Clearly, the depositional basin created by the Indian Creek Fault Zone explained the temporary reduction in stream velocity analogous to Coe's microdepositional situations. The depositional history preserved by the sediments of the T₀ and T₁ terraces shows that these landforms were not formed by simultaneous processes. This point is significant because it identifies Holocene environmental changes which were not evident in Coe's 1964 work and which may, when examined in more detail, help to provide a paleoecological framework for understanding changes in Archaic archeological assemblages.

ARCHEOLOGICAL STRATIGRAPHY

Following the discovery of deeply buried artifacts in Test Trench 8, additional trenching was carried out to gain a better understanding of the lateral extent of prehistoric material incorporated within the sediments of the T₁ terrace. Earlier archeological excavations by McCormick (1969, 1970), conducted a few hundred meters south of Trench 8 and upon the T₁ terrace surface, had suggested the presence of a deeply buried Early Archaic component at site 31Ch29. In addition, Wilson (1976; 17-22) had described the presence of thin, reddish brown lamellae which suggested relatively horizontal strata in portions of this site. McCormick had labeled these lamellae "percolation marks," but had offered no explanation for their origins or potential value in site interpretation. In addition, McCormick mistakenly referred to the T₁ terrace surface as a "natural levee" which further biased stratigraphic explanations.

With McCormick's archeological site stratigraphy in mind, and noting the similarity between it and the lower silty fine sand layers which yielded Early Archaic artifacts in Trench 8, several more test trenches were excavated to examine the subsurface geology and archeology of Sites 31Ch8 and 31Ch29. Six additional trenches were placed in 31Ch8 while four were placed in 31Ch29. The specific locations of these trenches were shown in a previous report (Commonwealth Associates Inc., 1979) and are only discussed briefly here. Each of the trenches showed evidence of a thick sequence of fine sands which lacked cross bedding or other sedimentary structures which would ordinarily indicate turbulent water

flow or active channel erosion and deposition. The sequence observed was an apparent homogeneous body of yellowish brown (10YR5/4) fine sands interrupted only by occasional lamellae of reddish brown (7.5YR4/4) silty fine sand. Such lamellae occurred in a relatively horizontal attitude similar to that described by McCormick (1969, 1970). As in Trench 8, the lamellae were often closely associated with artifacts.

Trench 10, excavated at site 31Ch29 and upon the T₁ terrace surface provided a more complete example of the archeological stratigraphy. Like the trenches in site 31Ch8, Trench 10 exposed a thick sequence of yellowish brown (10YR5/4) fine sands interbedded with reddish brown (7.5YR4/4) silty fine sand lamellae. An example of lamellae associated with a lithic artifact is shown on Figure 6.4. Diagnostic lithic artifacts belonging to the Kirk assemblage of Coe (1964) were found in association with two silty fine sand layers at about 1.75m below the surface of the T₁ terrace. Lithic artifacts near the surface of the trench suggested Coe's Late Archaic Savannah River association.

Because reddish brown silty fine sand lamellae were often found in association with artifacts, and because the sedimentary sequence lacked any evidence which suggested other than simple overbank deposition of suspended sediment during flooding, we chose to interpret these lamellae of silty fine sand as primary depositional units. The preliminary interpretation considered each reddish brown lamella together with the underlying yellowish brown fine sand, to represent a single graded bed indicative of a flood cycle. For example, each graded bed marked a period of ponding in the Indian Creek Fault Zone initiated by reduced velocity of the Haw River. Fine sands, silts, and clays carried in suspension by the river were settled out by gravity. Subsequent human occupation took place on each newly exposed surface of the floodplain.

This preliminary interpretation explained the apparent association of artifacts with reddish brown silty fine sand lamellae, but lacked the support of either detailed sedimentological analysis or extensive site stratigraphy. At this juncture it was clear that the homogeneous nature of the sands underlying the T₁ terrace indicated a relatively undisturbed sedimentary sequence unmarred by later erosion. These observations argued for an *in situ* archeological site which potentially preserved a valuable Holocene archeological and sedimentological record. On this basis, the decision was made to excavate a 144m² area on the surface of the T₁ terrace at 31Ch29.

Following the first phase of work at the sites, additional research was carried out to delineate the sedimentary sequence at site 31Ch29. Reexamination of Coe's (1964) Piedmont work led to uncertainties not only in our interpretation, but in his as well. For example, photographs of his stratigraphic profiles at the Doerschuk Site (Coe 1964:24) clearly showed the presence of lamellae similar to those encountered at sites 31Ch8 and 31Ch29, which were labelled as "clay seepage lines." Clay seepage lines were also described graphically from the Gaston Site on the Roanoke River (Coe 1964:89). At that site, these clay-rich features occurred in yellowish colored sands which suggested the same depositional patterns described for the Haw River sites.

At the Gaston Site, Coe suggested that clay seepage lines were associated in some way with standing water and marsh deposits. To be more specific, he argued for the yellowish sands with clay seepage lines

to have accumulated slowly and in a somewhat irregular manner. Although there are clay streaks and seepage lines running throughout the upper part of this zone, there is still no evidence of vegetation or organic matter in the sand (Coe 1964:87).

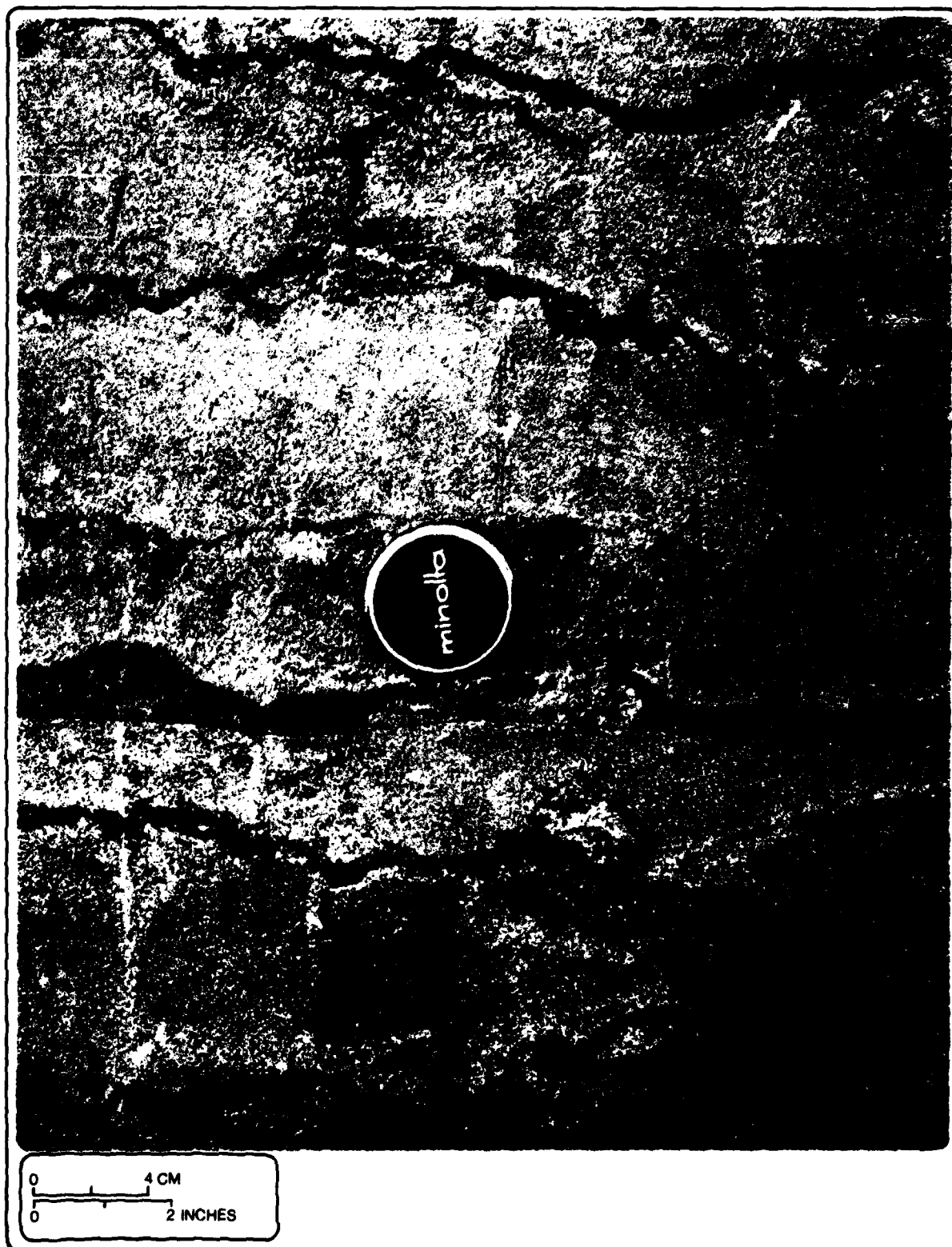
Clearly, Coe intended to explain genesis of these seepage lines by overbank clay deposition.

At the Doerschuk Site however, he presented a somewhat different explanation. Although clay seepage lines occur in association with his Archaic component, Coe's (1964) discussion of the alluvial history of the Doerschuk Site follows a different tack. Here he apparently considered the lamellae to be "varve-like."

The second phase of building consisted of overbank deposition which was laid down as thin horizontal laminae to a depth of four feet. This bed of varve-like deposits is not a general characteristic of floodplains, but instead, is the result of a local configuration of the river channel to its floodplain and valley walls...Following each flood a thin layer of sand was deposited after which it was covered by the finer particles of clay which settled out of the water last. These deposits were nearly uniform in thickness, but followed the irregular contours of the older sand level upon which they were laid. This would not have been the case if the water carrying these sediments had continued to move. The surface of the site at this time, therefore, must have been swampy and covered with standing water following periods of flood (Coe 1964:19).

Because both his discussions of these two sites associated clay seepage lines and varve-like laminae with marsh deposits, it seems that Coe was describing similar sedimentary phenomena. For purposes of our argument it was encouraging that we had chosen an explanation similar to that proposed sixteen years earlier. It was disturbing, however, to have such contradictory adjectives as "seepage" and later "percolation" associated with Piedmont sites. Both of these descriptions implied downward movement of water. Thus, the interpretation was unclear.

This uncertainty called for reexamination of the stratigraphy and detailed sedimentological analysis of the deposits. A first step in the reanalysis was an archeological literature search for evidence of similar depositional environments. The occurrences of lamellae were apparently widespread. Chapman (1978:19-20) for example, has referred to the presence of "pronounced lamellae" in Strata II, III, and V at the Bacon Farm Site (40LD35) along the Little Tennessee River in Loudon County, Tennessee. Chapman presented no geological explanation for these, other than an association with sandy loams. It is also informative to



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FIGURE 6.4
CLAY LAMELLAE-
SITE 31CH29

note that Chapman was using Coe's model for finding deeply buried Archaic sites in environmental settings downstream from constricted river channels. Presumably Chapman was selecting for similar abrupt changes in the river and unique depositional basins as well.

A second description was presented by Huscher (1964:7), who noted the lamellae at archeological sites along the Chattahoochee River near Columbus, Georgia. Huscher had extended the Coe model for the location of deeply buried Archaic sites to the edge of the Georgia Piedmont. Huscher referred to the prominent lamellae as "levigation lines" attributable to transported and redeposited clays which were "washed downward into underlying sediments" to form a series of lines suggestive of normal bedding planes. Huscher, however, was quick to point out that this was a "false stratigraphy." He argued that individual lines may have represented original bedding in some places, but may have defined the surface of the vadose water zone in others. These levigation lines occurred during periods of high rainfall when clay-charged groundwater deposited clays at the water contact. Yet Huscher felt that well developed lamellae represented discrete time intervals perhaps on the order of hundreds of years. Thus, although Huscher claimed that the lamellae were the product of secondary deposition of transported clays, he clung to a concept which suggested that they were also of some antiquity. While these interpretations were significantly different from those of Coe and those initially considered by this study, they still left problems in interpretation which could not be readily resolved.

A third example of potentially similar lamellae distributions in archeological context came from the Delaware River Valley of New Jersey and Pennsylvania. Kinsey (1972: xiii) noted that the alluvial soils of the Tocks Island Reservoir were deep except for the occurrence of numerous "narrow reddish-brown bands." He went on to note that "these bands were found widely distributed throughout the valley in the soil profiles of almost all of the sites in New Jersey and Pennsylvania where deep testing took place." Unlike other researchers, Kinsey sought professional geological advice from W. D. Sevon. Sevon studied lamellae from two separate sites and noted that "the reddish-brown bands were generally parallel to the floodplain surface, but some of the bands have crest-like and trough-like irregularities, and some separated bands joined laterally" (Kinsey 1972:xv). Sevon also noted that the upper boundary of the lamellae were sharply defined while the lower boundary was diffuse (compare with Figure 6.4). While Sevon observed that several lamellae contained artifacts, he could not see formal relationships between the lamellae and occupation levels.

Detailed sedimentological analyses were not carried out on the samples collected, yet Sevon was able to compare the sands from a single lamella with an adjacent fine sand layer. On the basis of binocular microscopic examination, he considered both sands to have the same proportions of silt and fine grained sand. Sevon considered the only difference between the two sediments to be in the relative proportions of iron oxide in the reddish-brown lamellae which seemed to occur as coatings on clay minerals. Because of the uniformity of fine grained sedimentation along the Delaware River, patterned site distributions, and lack of recognizable erosional discontinuities, Sevon suggested that deposition had always occurred under similar conditions and always as overbank deposition well removed from the main river channel.

More central to this study is Sevon's explanation for the formation of the reddish brown lamellae. He associated iron oxide-coated clays with podzolization and not primary deposition. He claimed that

downward moving water leaches the clay from the upper part of the sediment (A horizon) and concentration is initiated at a level (B horizon) which is probably related to a zone of interaction between downward moving (gravitational) and upward moving (capillary) waters (Kinsey 1972:xvi).

While Coe had labelled similar reddish brown lamellae as clay seepage lines and then claimed a primary depositional history for their formation, Sevon presented an opposite case. The lamellae were secondary deposits.

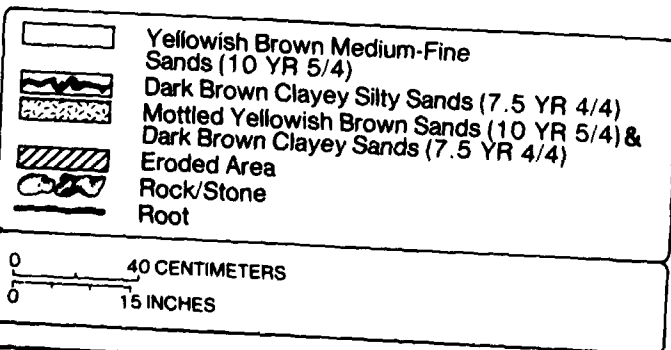
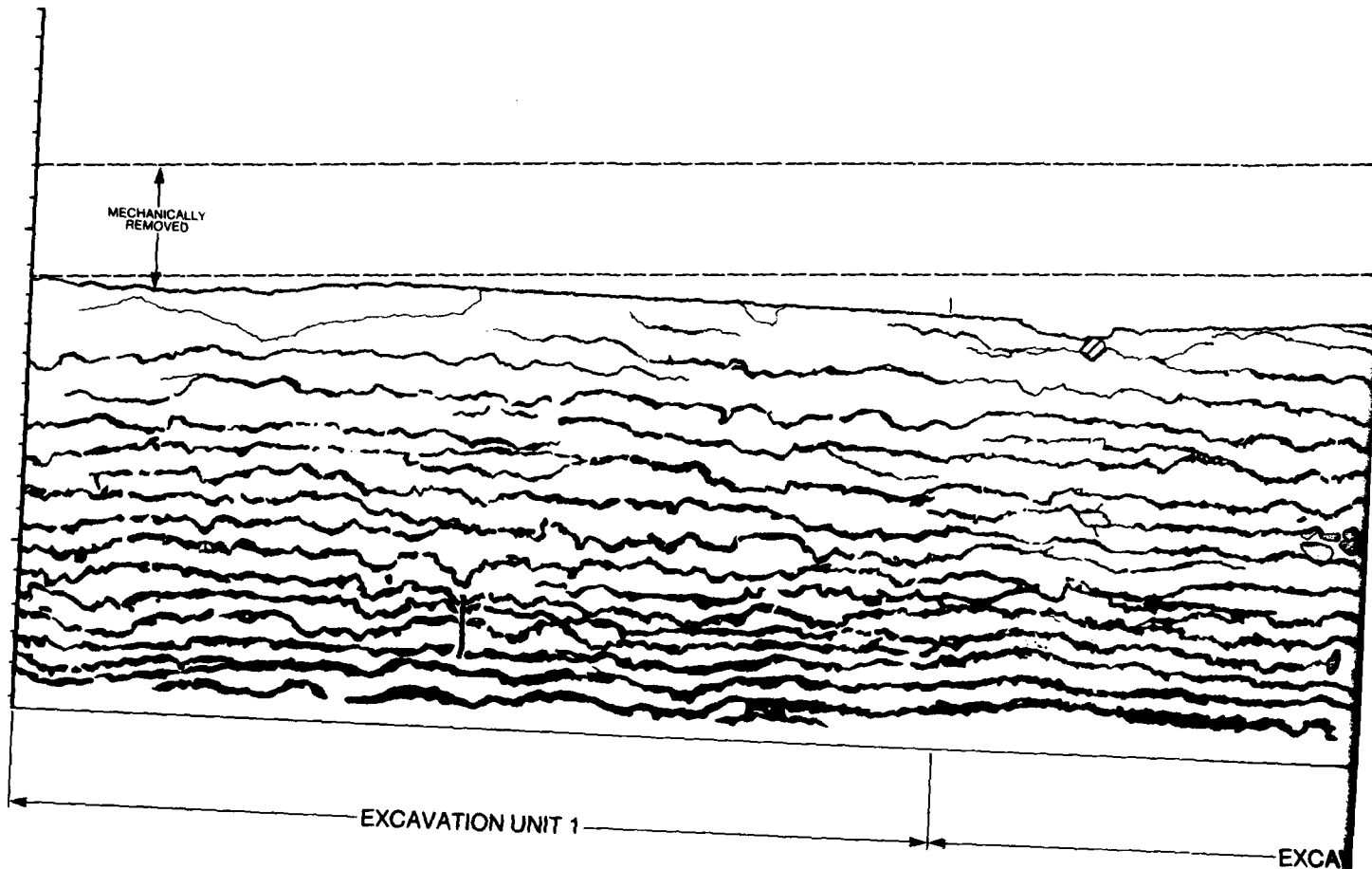
Stratigraphic Investigations — Site 31Ch29

Detailed archeological excavation at site 31Ch29 provided the most extensive and detailed stratigraphic sections for study and subsequent analysis. Hand excavation was preceded by the removal of as much as 1m of near surface sediments through the use of a tractor-mounted backhoe. This operation was designed for rapid removal of relatively late archeological evidence of the Woodland occupations. Archeological excavation began at an approximate elevation of 98.8m.

The first excavation units within the 12m x 12m block encountered reddish-brown lamellae in the uppermost horizontal levels. As anticipated, these lamellae were often associated with cultural materials although waste flakes and artifacts were also encountered in interlamellar fine sands. Throughout the excavation these associations persisted with few exceptions, strengthening our contention that the reddish-brown lamellae were probably of primary depositional origin and marked surfaces of graded beds produced by overbank flooding.

The character of clay lamellae as exposed in the north wall of the excavation is shown in Figures 6.4 and 6.5. In general these lamellae were oriented in nearly horizontal bands across the site and parallel to the surface of the T₁ terrace. Figure 6.5 shows these lamellae to often bifurcate and to form discontinuous lenses. In other cases, such as in Excavation Unit 2 (Figure 6.5), hearths marked by fire cracked rock concentrations were clearly located near the surfaces of prominent lamellae. This also lent credence to the hypothesis of primary depositional origins. Also important to our initial interpretation was the presence of root disturbances in lamellae at the base of Excavation Unit 4 which suggested vegetation cover over an exposed floodplain.

Anomalous lamellar patterns encountered during excavation cast doubts about initial interpretation for the depositional history of the site. A major problem was the occurrence of thick clay coatings on the upper surfaces of artifacts, but not necessarily on lower faces. Had occupation occurred on the surface of freshly deposited reddish-brown clays, coatings on lower surfaces would seem to be more probable as newly deposited fine sands capped



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AVERAGE ELEVATION OF ORIGINAL GROUND SURFACE (T, TERRACE)

AVERAGE DEPTH OF PLOWZONE (35cm.)

EXCAVATION SURFACE LEVEL

EXCAVATION UNIT 2

EXCAVATION UNIT 3

2

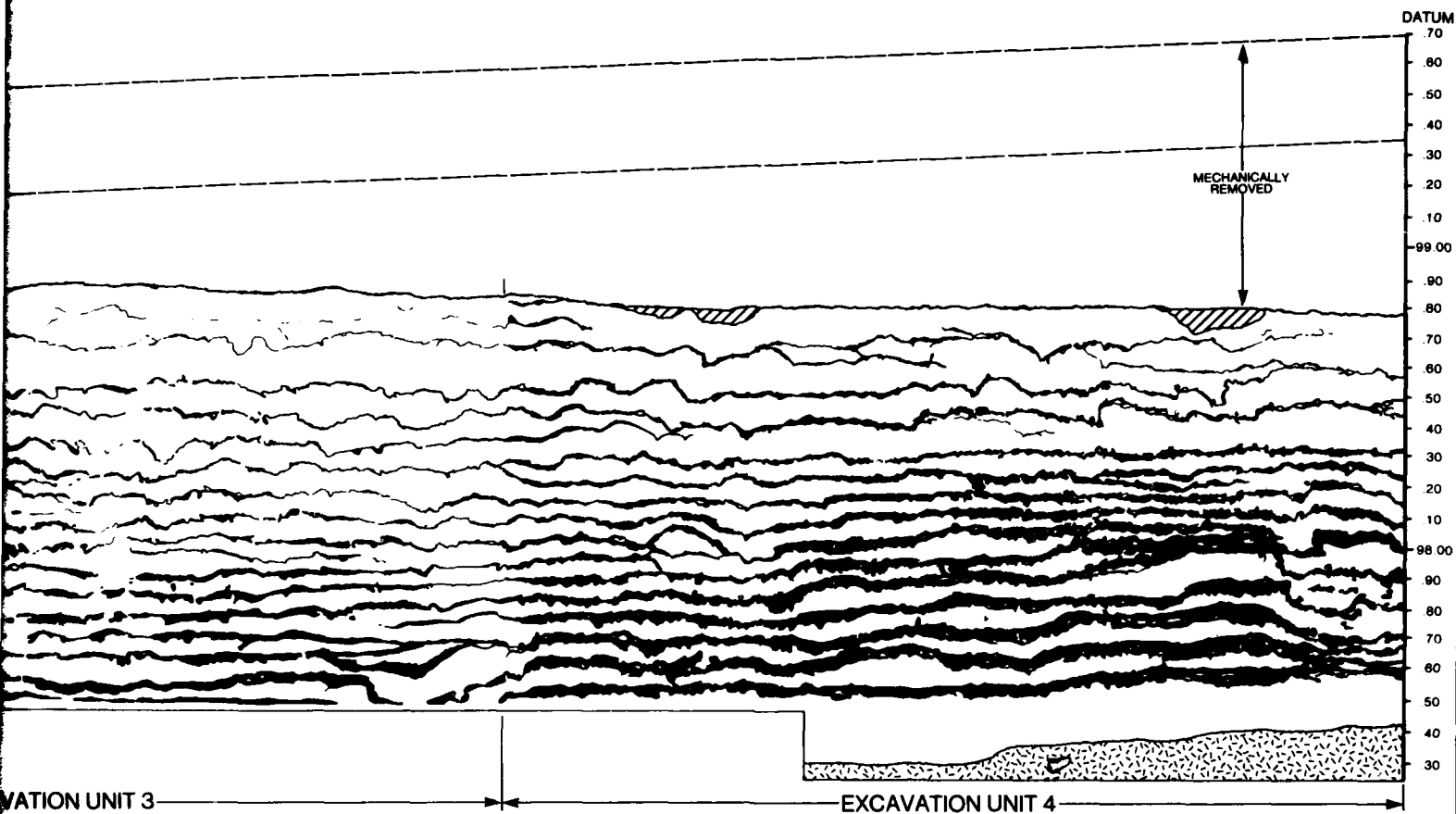


FIGURE 6.5
SITE STRATIGRAPHY
31CH29-BLOCK A-NORTH WALL

3

each occupation layer. A second anomalous pattern appeared during the excavation of carbonaceous features taken to represent hearths or pits excavated into underlying fine sands. Had pits been excavated into earlier sands, the normal pattern would have been for subsequent deposition to have filled these pits. The distinctive lamellar sediment, could be expected to have been draped into each pit from a contemporaneous land surface. Instead, the lamellae which were visible in the carbonaceous sands of each pit were often horizontal and seemed to be contiguous with adjacent undisturbed lamellae. Clearly there were difficulties in adopting a simple primary depositional model to explain the stratigraphy. Sevon's discussion (Kinsey 1972) of the possible secondary nature of these kinds of lamellae, therefore, began to take on more meaning. Yet it was not easy to discount the frequent occurrence of artifacts associated with individual lamellae.

As an aid to the interpretation of the site, independent geological observers were called upon for advice. Following excavation, the site was visited by William Farrand of the University of Michigan and Jack Donahue of the University of Pittsburgh. After a few hours at the site and vigorous discussion, both geologists agreed that the lamellae present in the site were of secondary origin and were not a product of floodplain deposition. Farrand was quick to assert that such lamellae were pedogenic and seemed relegated to fine sand deposits. In addition Farrand claimed that similar lamellae occurred in Late Pleistocene outwash sands in Michigan and were deposited independent of bedding. His views are covered more fully in the following personal communication:

During my recent visit to the Haw River sites mentioned above we observed the puzzling, fine-grained, dark, crenulated bands that are so conspicuous on the faces of all the exposed sections of the first terrace above the floodplain. My first, and continuing, impression of these features is that they are subsoil textural lamellae (also known as "beta horizons"). Such lamellae are very common in well-sorted fine-grained sands and are in most case pedogenic horizons (see J. C. Dijkerman et al. 1967, *Soil Science* 104: 7-16). Their occurrence throughout the United States and typical appearance in some New York localities are illustrated in the enclosed figures.

Dijkerman and his colleagues observe from field, microscopic and experimental work that such lamellae may form in one or more of the three following ways:

1. as original sedimentary layers (= "laminae" of sedimentologists) that can be distinguished by the fact that they follow stratification, show sedimentary structures and are texturally distinct from intervening layers;
2. as illuvial horizons controlled by primary sedimentary features, i.e., illuvial clay deposited along bedding planes;
3. as illuvial horizons formed independently of any primary features.

In methods 2. and 3. (above) the illuvial nature of the lamellae is proven by micromorphological study that shows oriented clay coatings and clay bridges around and between sand grains. Experiments with sand sedimentation columns and clay suspensions reproduced these same features.

In the case of the Haw River sites the lamellae do not follow any observable primary sedimentary features and are presumably illuvial, pedogenic features. Absolute confirmation would require micromorphologic work, but I seriously doubt that is necessary. If your grain-size analysis supports the contention that there was an original difference in grain size between the lamellae and the inter-lamellar layers, one might suggest that the lamellae are of the illuvial-sedimentary kind (2., above). However, given the irregular, anastomosing character of the lamellae and their complex crenulations, which are very unlikely to be features of the original fluvial deposit, I would favor a pure illuvial origin.

In any case, the Haw River lamellae appear to be of illuvial origin, thus postdating the deposition of the fluvial sediments of the sites. They are in no way to be interpreted as old land surfaces contemporary with the human occupations of the area. The question remains, however, whether all the lamellae formed during one period, i.e., after the deposition of all the sand deposits observed in the sites and contemporary with the modern soil profile, or periodically in several episodes, each being associated with an unconformity or hiatus of fluvial sedimentation. At present I opt for the former interpretation on the basis of my observations that the lamellae in any given section seem to vary regularly in thickness (if they vary at all), either progressively thicker from top to bottom, or vice-versa. In other words, I did not see obvious evidence of discontinuities in the thickness relations of the lamellae that might indicate hiatuses. (I realize that the archaeological observations seem to indicate hiatuses — or marked drops in the rate of sediment accumulation, but I would recommend that the evidence be interpreted judiciously with respect to the deposition-pedogenic regime.) (W. R. Farrand personal communication 2/25/80).

Donahue had never observed lamellae such as those displayed at site 31Ch29. His observations were directed towards a lack of sedimentary structures in the exposed sequence, and are stated below.

I think your interpretation for the deposition of the sand unit is probably correct. It seems likely, especially considering the sequential arrangement of archeological material that the sand represents a stacked series of flood deposits. The one point that bothers me is the lack of stacked fining upward sequences which I would expect to see if there was repeated flooding. Apparently no coarse material was transported into the area; there is no indication of coarser lag deposits. The coarse transported fraction may be restricted to the Haw River channel itself. If time and money are available, I would suggest size analysis for a series of very small interval samples (1cm) to see if fining upward sequences are present.

The configuration of geometry of the silt layers, especially in the first excavation we visited makes it seem highly unlikely that they are depositional features. The approach to what looks like stylolite geometry and the bifurcation of layers makes original deposition a poor explanation unless there was considerable movement and alteration of material after deposition. I would also expect to see a gradational sequence with fining upward into the silt layer and then a sharp contact going back to the sand layer. Instead, both upper and lower contacts are abrupt.

I concur with Bill Farrand's comment that the layers are pedogenic in nature. The downward movement of clay and its accumulation within discrete layers seems very reasonable. Our comparison of the cumulative curves for the sand and silt samples shows the units are practically identical except for the inclusions of silt and clay in the silt layers. The increased thickness and decreased spacing for the silt layers as you go down through the section suggests that this is a continuous process with the older layers having a greater accumulation of fines. A big unanswered question for me is what determines the position for the silt layer. If there are a series of very subtle fining upward sequences, the clays may be "hanging up" at the base of each sequence, where grain size shows a slight but sudden drop in diameter. As I stated above, this would have to be tested by grain size analysis of small interval samples. Also, if you can show statistically that artifact distribution correlates with silt layers it would suggest that the silt layers reflect original depositional surfaces with occupations on those surfaces. From your artifact distribution and inferred ages from other sites, it looked to me as though the depositional rate and thickness of deposits was increasing with time. This would correlate with increased spacing of silt layers upward in the section. That is, original bedding surfaces are more widely spaced as you go up through the section.

The other possible explanation for the layers is that they represent the position of "colloidal" fronts moving through the sand. I cannot comment on that since my knowledge of colloid chemistry is rather scant. I do, however, suspect that the downward percolation of clays through the sand had caused a homogenization of the sand layers. That is, any original layering or banding in the sand sequence may have been removed by downward percolation of clay.

One other point comes to mind. The silt layers appeared to thin in the direction of the Haw River channel. If the silts and clays are transported in during flood events, you might expect to see increased clay away from the channel. That is, the coarser sediment is dropped first with the fines settling out away from the channel (J. Donahue, personal communication 1980).

While both Farrand and Donahue generally agreed to the pedogenic origin for the complex lamellae at 31Ch29, each had different interpretation for the archeological character of the site. Farrand favored a pure illuvial origin for clays in each lamella based upon the "anastomosing character of the lamellae." Donahue alternately considered that individual lamellae may have formed at the base of each graded bed left by episodic flooding of the Haw River.

These outside opinions answered certain questions regarding anomalous conditions at site 31Ch29, but created others as well. The solution to the problems of understanding the depositional history at the site lay in a detailed sedimentological analysis of these deposits.

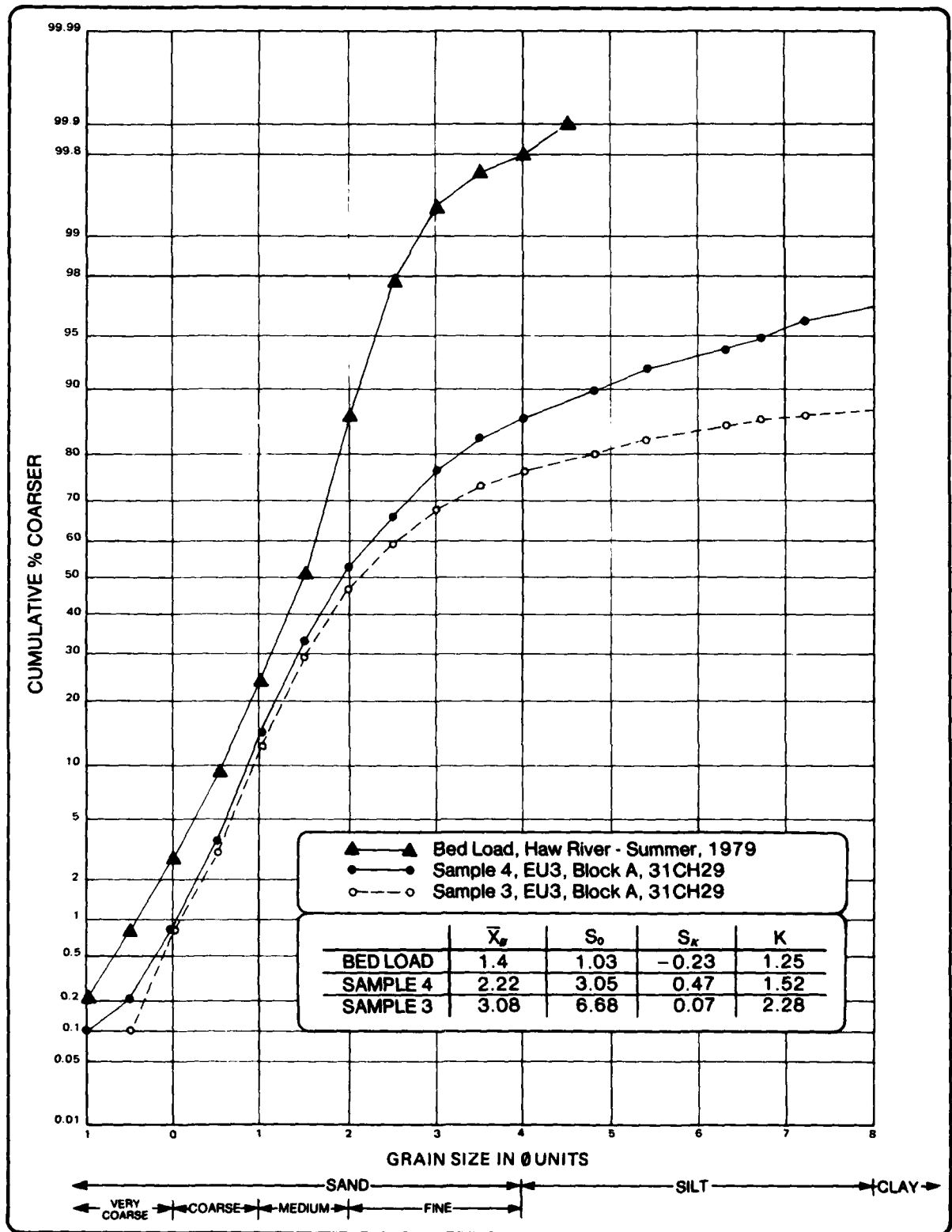
SEDIMENTOLOGY

Preliminary Analysis

The final strategy of sedimentological analysis was designed to provide three basic bodies of information on the floodplain deposits associated with the T₁ terrace system along the Haw River. These were: 1) to ascertain the depositional history of the fine sand deposits of the terrace; 2) to identify the alluvial or illuvial origins of clays within soil lamellae at the site; and 3) to explain associations between the fine sands, soil lamellae, and artifacts.

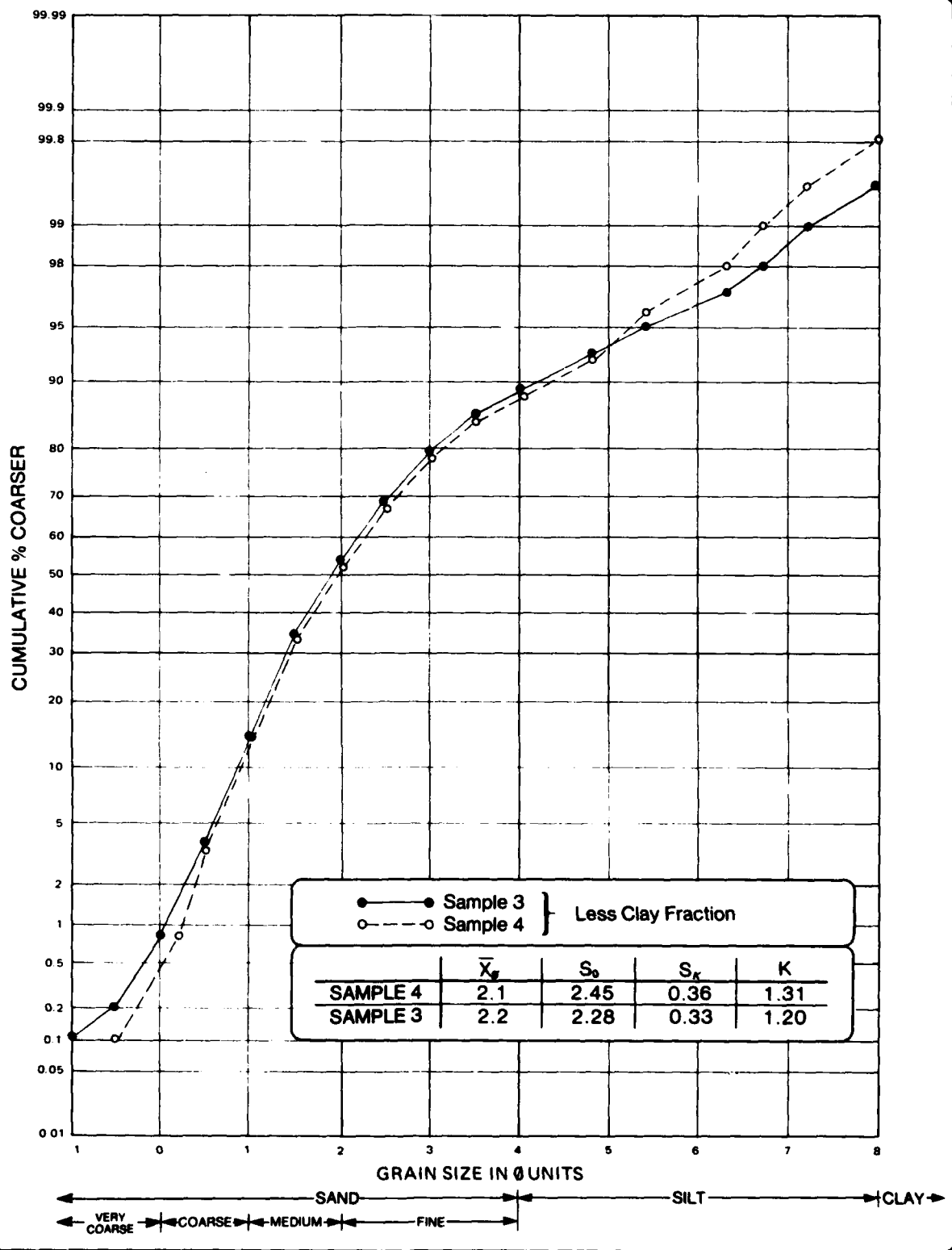
The depositional history of the floodplain was verified generally by comparing granulometric data from individual lamellae, interlamellar fine sands, and recent channel deposits left after flooding in August of 1979. Comparative grain-size curves are illustrated in Figures 6.6 and 6.7. Bed load deposits, related to the high velocity flows of the main channel of the Haw River at flood stage, were deposited as bars of medium to coarse sand at confluences with the mouths of tributary streams or sloughs with the main river channel. An example of these sands is referred to as the Haw River bed load. The cumulative grain size curve shows the presence of a predominant normal population related to grains moved by saltation (cf. Friedman and Sanders 1978:72-78).

The absence of a significant suspended load population of silt and clay verifies the interpretation of the sediment as a channel deposit and provides ready comparison with the sands of the T₁ terrace. The sorting coefficient (S_0) of 1.03 shows that this sample is well sorted, once again reflecting its sedimentary origins as a channel deposit. Sample 4, EU3, consists of fine sands of the T₁ alluvial fill while Sample 3, EU3, is the lamella underlying this fine sand. Samples 3 and 4 thus formed a pair of associated deposits with Sample 3 tentatively identified as the surface sediment of an underlying graded bed. Figure 6.6 shows that textural characteristics of Samples 3 and 4 vary considerably from the bed load deposits of the river. For example, the two sediments of the T₂ terrace are strongly fine-skewed and are better sorted in their central ranges than in their coarse or extremes. While these two samples could conceivably represent a suspended load population related to periodic flood



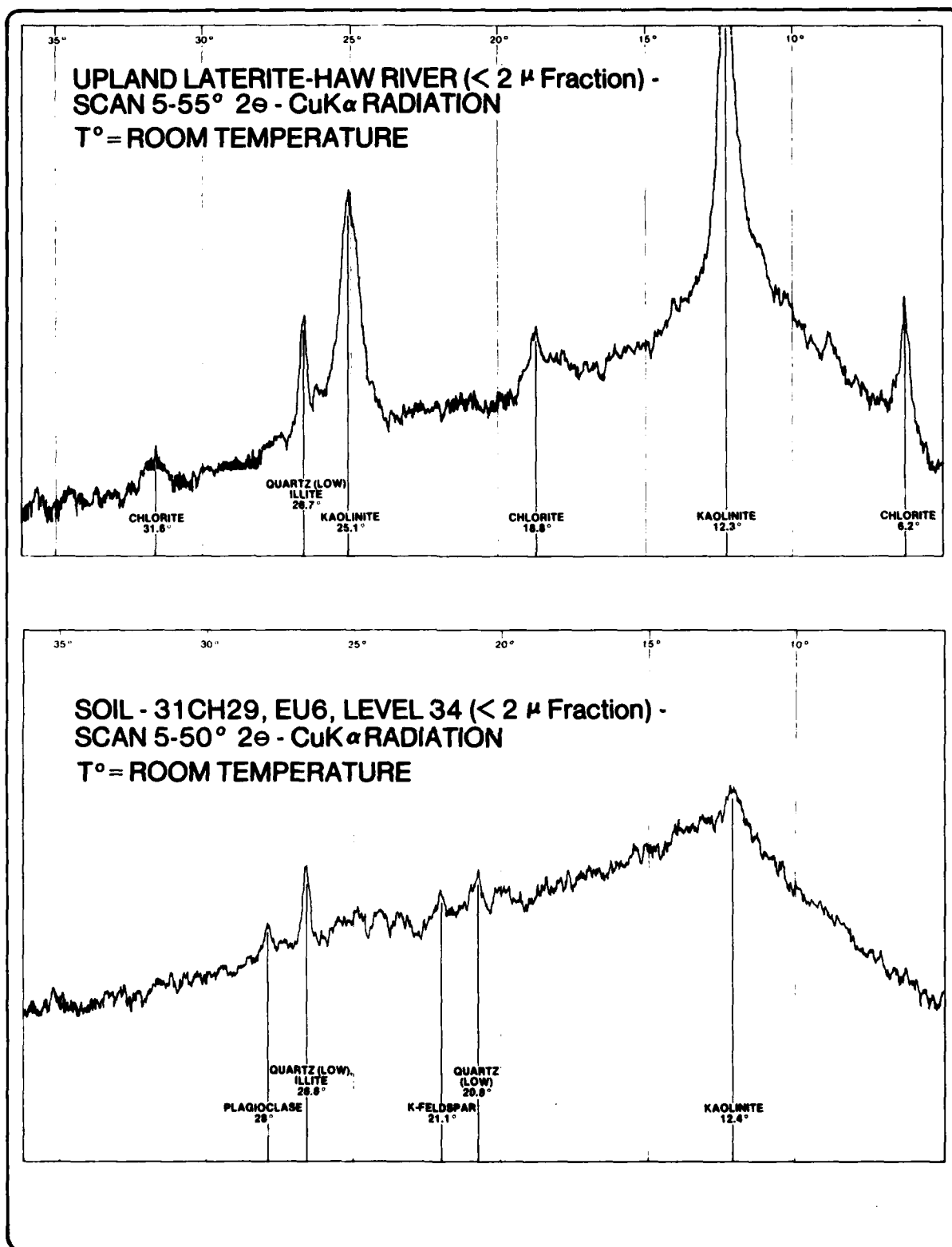
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FIGURE 6.6
GRAIN SIZE CURVE-
HAW RIVER BEDLOAD WITH FINE SAND &
ADJACENT CLAY LAMELLAE-31CH29



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FIGURE 6.7
GRAIN SIZE CURVE
 ADJACENT PAIRS OF FINE SAND &
 CLAY LAMELLAE (CLAY FRACTION
 DELETED)-31CH29



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FIGURE 6.8
X-RAY DIFFRACTOGRAMS-
CLAYS FROM UPLAND SOILS &
CLAY LAMELLAE

deposition, the similarity in slope and grain size in the coarse and fine sand fractions suggests that both Samples 3 and 4 are related to a single deposit and that Sample 3 represents an overbank fine sand deposition atop a relict land surface.

Textural similarities between Samples 3 and 4 are more apparent in Figure 6.7. Here, the silt and clay fractions were deleted from the total weight of the samples shown in Figure 6.6. New cumulative grain-size curves resulting from this corrected calculation show that the sands of Samples 3 and 4 are virtually identical. This similarity points to the presence of clays derived from a secondary source and argues for illuviation rather than primary deposition. Nonetheless, these recalculated curves, as well as the grain size parameters shown in Figure 6.7 point to the alluvial origin of the primary deposits. The mean grain size of both samples, 2.1 and 2.2 respectively, and the slopes of their cumulative curves identify them as medium to fine grained sands which were carried in suspension in the flood waters of the Haw River. Comparison with modern channel deposits in Figure 6.6 shows that the sediments of the T₁ terrace are not channel deposits, but were laid down away from the main channel of the river. Our interpretation of the Indian Creek Fault Zone as a depositional basin providing a rapid break in stream gradient and hence velocity is then a valid one.

Clay Mineralogy

To further test the primary versus secondary origin of clays in each lamella, the clay minerals of the representative lamella were compared with the clay mineral suite of a nearby upland soil. If the clays present in the floodplain lamella compared favorably with those characteristics of upland soils, it could be argued that they may be derived from eroded upland soils. This would point to possible primary deposition as well. However, if there were dissimilar clay mineral suites, secondary origins, would be suggested; at least no direct relationship with eroded upland soils from the Carolina Slate Belt could be demonstrated.

Figure 6.8 shows comparative diffractograms for an upland soil and a representative lamella. The clay fraction from the upland soils which has the same color as the subsoil lamella (7.5YR4/4) defines a clay mineral suite marked by the presence of kaolinite, chlorite, and subordinate illite. These point to a long weathering history for the surface of the adjacent uplands. The clay fraction from the sample lamella, on the other hand, showed a radically different diffraction pattern. For example, there were no strongly developed clay minerals. Rather, the clay fraction from this lamella exhibited a slight kaolinite peak at 12.4° and a low quartz-illite peak at 26.6°. Neither of these peaks presents convincing evidence for strong weathering. The clays of the lamella also contain recognizable mixtures of both plagioclase and K-feldspars which would normally be among the first minerals to disappear under chemical weathering processes. Clearly there appears to be no relation between the clays of the upland soils and those of the subsoil lamella. The evidence firmly indicates secondary origins for clays incorporated within the alluvial sands of the T₂ terrace; their source, as Sevon (Kinsey 1972) and Farrand suggested, was illuvial. This did not, however, adequately explain the apparent association between subsoil lamellae and artifact assemblages.

Subsoil Lamellae

Djikerman et al. (1967) considered three major possibilities for the formation of subsoil lamellae. These were:

1. Of original sedimentary origin
2. Illuvial horizons controlled by primary sedimentary features
3. Illuvial horizons formed independently of primary sedimentary features.

Both the grain size analysis in Figure 6.7 and the clay mineral analysis in Figure 6.8 have eliminated the first of these alternatives from further consideration; the others, however, warrant additional investigation. For the interpretation of sites 31Ch8 and 31Ch29, it was imperative that these two alternatives be studied. Verification of the lamellae as illuvial clay deposits controlled by primary sedimentation could explain the apparent association of artifacts with individual lamellae. This case would provide stratigraphic control for studying the sedimentary sequence. On the other hand, if it was determined that the origins of the lamellae were independent of primary sedimentation, it could severely complicate the interpretation of the site stratigraphy at site 31Ch29 and could conceivably eliminate control of the stratified artifact assemblages. Such an interpretation would force the research team to rely solely on arbitrary horizontal excavation levels for reconstructing past occupation patterns, a condition which would hinder meaningful time-space analyses. On one extreme we were assured that Coe's (1964:19) interpretation of "varve-like" deposits related to a local configuration of the river channel was invalid. At the other extreme we could not adopt his loose concept of clay seepage lines requiring the presence of standing water and marsh deposits for formation (Coe 1964:87). The grain size analyses ruled out such depositional environments. Rather than acquiesce to Huscher's (1964:7) claim of false stratigraphy and thereby abandon the potential value of the Haw River sites, it seemed more reasonable to attack the problem through sedimentological analysis.

A total of 34 sediment samples had been taken from the north wall of Excavation Unit 3 at site 31Ch29. These samples consisted of approximately 100-250g of sediment from each discernible subsoil lamella and its interlamellar fine sand unit. For ease of horizontal association across the site (during excavation), the lamellae which could be visibly correlated across the site were numbered 1 to 31 sequentially downward from the surface of the excavation to the sandy silts at the base of the site. Interlamellar fine sand units were numbered from 2 to 30. This numbering system was helpful for excavators during ongoing fieldwork and was extended to the sedimentological analyses as well. Lamellae and interlamellar units which lay stratigraphically above the surface of the hand excavated levels, but which were preserved in the north wall of Excavation Unit 3 were given the numbers 0, -1, -2, -3, -4, -5, etc. Subsoil lamellae were thus consistently identified with odd numbers, while interlamellar fine sands were designated by even numbers.

Grain sizes for each sample were obtained utilizing graded sieve and hydrometer methods. The resulting granulometric data were plotted on a probability scale as in Figures 6.6 and 6.7. In general, these curves displayed distributions similar to Samples 3 and 4 in

Figure 6.6. That is, the sand fraction of each sample, lamellar as well as interlamellar, was similar to those from adjacent units. Thus, medium to fine-grained sands were consistent and moderately well sorted, indicating origins as suspended load sediments deposited during episodic overbank flooding. Similarly, samples displayed prominent clay and silt tails which made up as much as 15 percent of the interlamellar sand layers and as much as 25 to 30 percent of the subsoil lamellae. Although such tails can be confused with a population of suspended load fine grained sediments when viewed separately, comparisons presented earlier (in Figures 6.7 and 6.8) demonstrate that these clay tails are not related to the primary deposit. Thus the overall grain size parameters for each subsoil lamella must be viewed with caution.

As an aid to understanding the depositional patterns of the floodplain, the mean grain sizes for lamellae and interlamellar sands were plotted separately in relation to the stratigraphy of Excavation Unit 3 (Figure 6.9). The interlamellar sand curve shows that the low portion of the section is made up of sands with means in the 2 to 2.5 size range while the upper portion of the section is finer grained with means in the 2.5 to 3.0 size range. More specifically, the coarser grained sediments are found between Units 6 and 30 while the finer sediments make up the units between 2 and 4.

This relationship is not striking in and of itself as the aggrading floodplain would normally be expected to fine upward through time as it rose in elevation and was less apt to be flooded by deeper and more turbulent flood waters. An interesting comparison can be made between the mean grain sizes of the interlamellar sands and those of the subsoil lamellae. Above Unit 9, the mean grain size curve for lamellae generally parallels that for interlamellar sands. Between Units 11 to 17, however, the mean grain size becomes more coarse, indicating a lower proportion of illuvial clay in this zone. Below Unit 17, the mean grain size shows a greater divergence from the mean grain sizes of the interlamellar sands. This suggests that the lamellae at the base of the section have higher clay contents than those above. In terms of the archeological record, those lamellae with higher clay contents are associated with the Late Paleo-Indian (Hardaway-Dalton) (10,000-9500 B.P.) through Palmer/Kirk levels of the site (9500-9000 B.P.). The lamellae with lower clay contents relate to the Bifurcate, Kanawha, and Stanly occupations (ca. 9000-7000 B.P.) Finally the lamellae with relatively constant clay contents can be associated with the Morrow Mountain and Savannah River occupations (c. 7000-3000 B.P.). Such differences may suggest that the pedogenic rates and processes which produced these alluvial clays were variable through time.

While pertinent from a paleo-environmental perspective, these variations in clay content do not resolve the problem of illuvial-sedimentary vs. purely illuvial origins of subsoil lamellae. In addition the cases presented by Dijkerman et al. (1967) were not helpful for comparative purposes. These authors developed their category of illuvial-sedimentary origin on the basis of clays paralleling original stratification planes. For example, lamellae were found which either conformed to bedding planes or featured other sedimentary structures such as cross bedding and ripple marks. No similar structures were visible at sites 31Ch29 or 31Ch8.

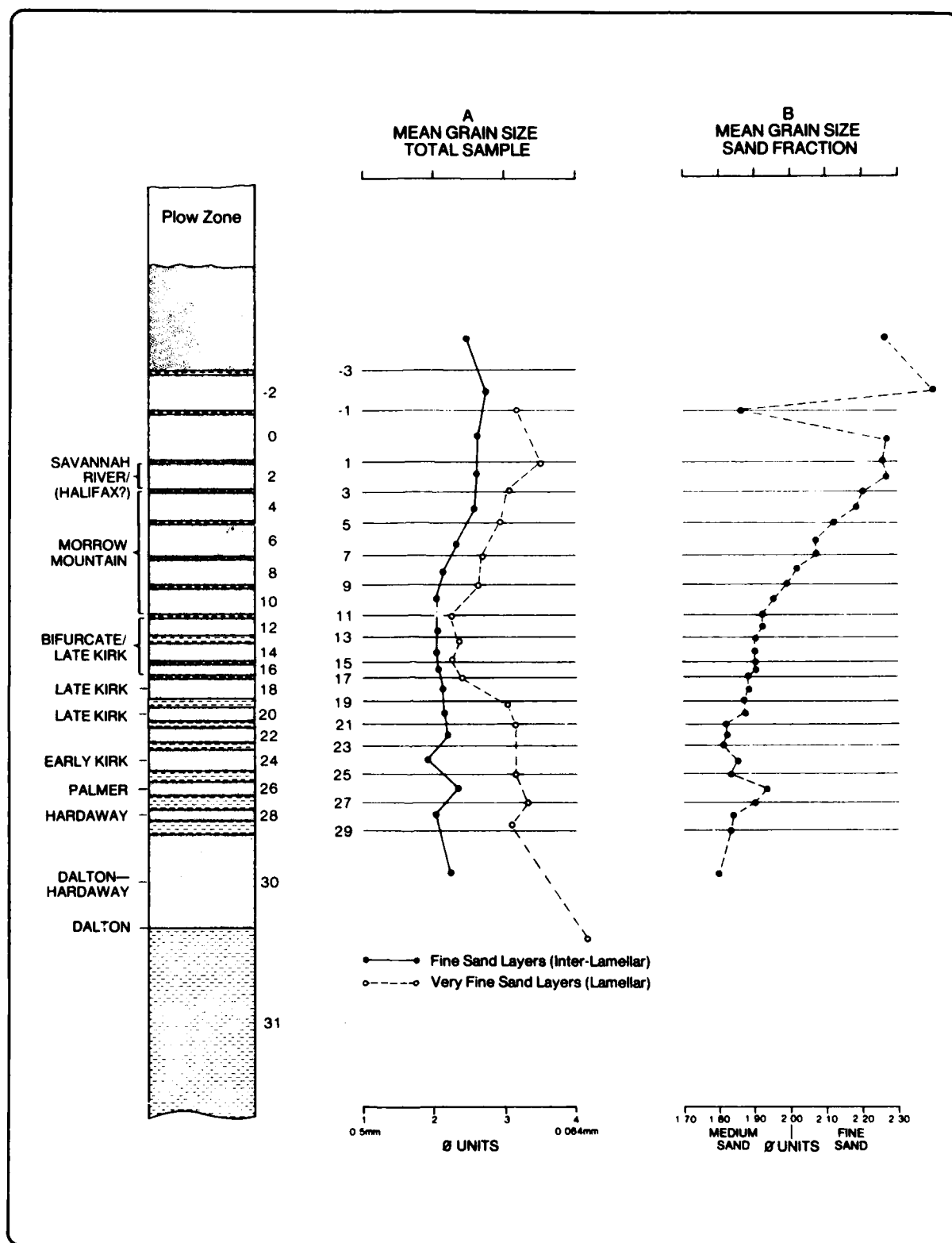
A potential solution was presented by the Soil Conservation Service (U.S.D.A. Soil Conservation Service 1975:25). In a general description of argillic horizons, the S.C.S. noted that:

The genesis of the lamellae is not fully understood. A reasonable hypothesis is that pores slightly larger than those of the next layer above cause water to hang in the soil. If this water is withdrawn by plants or as vapor, any suspended clay is left behind and the difference in size of pores is accentuated. Thus, once the process is begun, the clay continues to accumulate in the same place. The data for pedon 19 show slightly coarser sand just below two of the three lamellae that were sampled. The effect of lamellae, even those that are thin, on water bearing capacities can be very large because water hangs in each lamella (U.S.D.A. 1975: 25).

The Soil Conservation Service thus identified differences in grain size as a mechanism for the formation of subsoil lamellae. Such an observation provided a tangible direction for additional analyses of the Haw River sites. Because of the lack of visible bedding planes or other sedimentary structures in deposits of the T₁ terrace system it was difficult to claim with any certainty that the lamellae present were of the illuvial-sedimentary, or purely illuvial types. Grain size differences provided an hypothesis which could be tested.

This argument suggests that both pore space and the retention of interstitial water are relevant factors in the formation of the lamellae. Therefore, had episodic flooding taken place over the T₁ terrace surface discrete graded beds of fine sand marked by coarser grained sediments would be expected at the base of each bed and would grade progressively finer up the sequence. These were the same textural changes which Donahue had found lacking at site 31Ch29. Graded beds are the expected end result as the rapid and turbulent flowing stream carrying these particles decreases in velocity at the juncture of the Indian Creek Fault Zone. Friedman and Sanders (1978:101) term such suspended sediments aqueous suspensions. For fine grained sands such as those constituting the T₁ terrace sediments, these authors point out that a threshold forward velocity of approximately 50cm/sec. is required to maintain the sediments in suspension. This average forward speed is required to overcome the settling of fine sand in water at a rate of 4 cm/sec. These limiting velocities are derived by Friedman and Sanders (1978:100) and are based on the general relationship that upward flow in turbulent eddies is about 1/12 of the mean forward speed of the current. Thus, the fine sands making up the T₁ terrace sediments at Haw River are the result of a drop in forward stream velocity below the critical limits of 50 cm/sec. More importantly, the sand body should display a series of graded beds indicative of this depositional environment.

Similarly, this depositional pattern accounted for the apparent concentration of artifacts in and around individual clay lamellae. Rather than representing a land surface upon which subsequent occupation took place, the lamellae more reasonably represent the bases of a cyclic depositional unit marked by slight differences in grain size. According to this interpretation prehistoric occupations were buried by subsequent episodic floods.



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FIGURE 6.9
GRAIN SIZE ANALYSIS-
SITE 31CH29

Slightly coarser grain sizes at the base of each cyclic unit covered artifacts left behind on the previously exposed surface of the floodplain, thereby imbedding these artifacts in the base of each unit. Such an hypothesis also accounts for the occurrence of artifacts in loose association with lamellae and not directly on the surface of each one.

In terms of the Soil Conservation Service analysis, this series of cyclic graded beds is an expression of the general mechanism for the deposition of illuvial clays formed during pedogenesis. In the series of graded beds, the slightly coarser grained base of each unit rests upon the finer grained surface of the previously deposited graded bed. Given the initiation of chemical weathering during pedogenesis, clay sized particles formed by the breakdown of feldspars or in the form of amorphous iron oxides are carried downward with surface waters by gravity. These clay-charged waters migrate downward through the section until they reach the base of each graded bed. There, an abrupt change in grain size from coarse to fine impedes further downward water flow. Both water and translocated clays tend to concentrate in the greater pore spaces at the base of each graded bed. Through evaporation of surface water or through the evapotranspiration of plants with roots in the saturated bases of graded beds, illuvial clays are deposited in pore spaces. The Soil Conservation Service (U.S.D.A. Soil Conservation Service 1975:25) suggests that "... once this process is begun, the clay continues to accumulate in the same place." Given this hypothesis, it was possible to consider the Haw River lamellae to be of illuvial-sedimentary origin.

As a test of this hypothesis it was necessary to consider only the sand fraction from each sediment sample. If the working hypothesis was correct, slightly more coarse grained sands should occur in each subsoil lamella than those recorded for each overlying sand unit. This test was accomplished by deleting the silt and clay fractions ($> 4 \phi$) from the same samples shown in Figure 6.9 and by recalculating the mean ϕ sizes using the graphic techniques proposed by Folk (1974). Any clays present were assumed to be of secondary origin while percentage of silt size particles was considered to be potentially biased by the imprecise hydrometer technique used for analysis. The weight percentages of the sand fraction, on the other hand, were obtained directly from measured weights of specific grain size intervals ($1/2 \phi$ unit) and measured to the nearest .01 gram using a triple beam balance. Table 6.2 shows the recalculated mean ϕ values for sands of each subsoil lamella and interlamellar unit. These units were separated into adjacent pairs representing hypothetical graded beds and numbered from I to XV. For each adjacent pair, the difference between the mean ϕ value of the interlamellar sand and the underlying subsoil lamella is shown as $\Delta\phi$. Units -1 through -4 were not considered in this analysis because of possible sampling or laboratory errors. For pairs I through XV, which represent units 0 through 29 in the sedimentary sequence shown in Figure 6.9, the expected increase in mean ϕ size was observed, with the exception of pair IV which showed no difference in grain size between the units and pair VIII which showed the opposite relationship. For the 15 pairs examined the difference in mean ϕ size ranged from 0 to .07 ϕ units with a mean increase in grain size of .023 ϕ units for the sand fractions of each subsoil lamella. On a first examination, these values support the working hypothesis of illuvial clays replacing coarser grained sands at the base of graded beds left by episodic flooding of the river.

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THE HAW RIVER SITES: ARCHAEOLOGICAL INVESTIGATIONS AT
TWO STRATIFIED SITE.: (U) COMMONWEALTH ASSOCIATES INC
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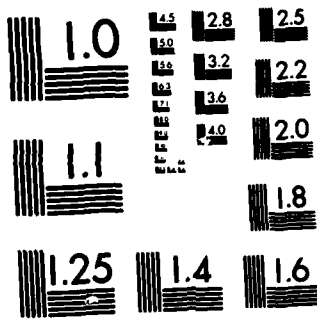
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Figure 6.9b shows the revised curve for mean phi size as recalculated from the means shown in Table 6.2. As in Figure 6.9a the sequence fines upward with the lower portion of the section composed of medium grained sands and the upper portion composed of fine grained sands. A detailed view of this grain size curve also shows a jagged outline marked by abruptly coarser grain sizes in association with subsoil lamellae.

Two tests were used to verify the statistical validity of the observed difference in mean phi values for each labelled pair. These were the Student's t-test for Paired Variates (Thomas 1975:235-260) and the Wilcoxon Signed Ranks Test (Thomas 1975:332-336). The Student's t-test examined whether or not chance occurrence explained this population of paired mean phi values, with 13 of 15 pairs represented by slightly coarser grained sands at the base of each pair. A null hypothesis, H_0 , considered this distribution to be a chance occurrence. The value of t for the case of chance occurrence at a .001 level of significance was found to be $t < 4.140$. An alternative hypothesis H_1 represented by $t > 4.140$ pointed to a nonrandom occurrence of paired mean phi sizes. The calculated value of t was found to be 4.23 at 14 degrees of freedom which rejected the null hypothesis and indicated a nonrandom distribution.

The Wilcoxon Signed-Ranks Test examined a similar null hypothesis. In this case, H_0 was also rejected indicating that the differences in mean grain sizes were expected to occur by chance in less than one sample per thousand samples selected ($p = .0006$).

While these statistical tests argued strongly for the nonrandom occurrence of the observed paired mean phi values, they could not be used with certainty for stratigraphic purposes. For example, because the sediments of the floodplain were observed to fine upward, the normal case would provide for a consistently greater grain size beneath each sand unit sampled. Thus at face value the sedimentological and statistical data presented a moot point for any argument which sought to relate subsoil lamellae with coarser grained sands at the base of graded beds.

A concrete answer to this argument was provided not by sedimentological data, but through detailed archeological excavation and more importantly by careful attention to site stratigraphy. In various excavation units of Block A at 31Ch29 reversed archeological stratigraphy was noted. In these cases, Middle Archaic Morrow Mountain artifacts were occasionally found stratigraphically lower than Early Archaic Kirk artifacts. In less controlled excavations this occurrence might have been dismissed as site disturbance by unknown factors. At 31Ch29, however, the type of disturbance could be clearly identified.

A clear example was provided by profiles from Excavation Unit 1. Figure 6.4 of the north wall of Block A showed a generally horizontal distribution of subsoil lamellae across the site from Excavation Unit 1 to Excavation Unit 4. Other excavation units provided east-west profiles at one meter intervals across the site as they were dug. One such profile is shown in Figure 6.10. A solution to the general question of subsoil lamellae, graded beds and reversed archeological stratigraphy is evident here, and integrates these geoarcheological observations.

TABLE 6.2
RECALCULATED MEAN PHI VALUES, SITE 31Ch29

Unit No.	Pair No.	Sand	Lamellae	(Sand-Lamella)
-4		2.27		
-3			N.A.	-
-2		2.40		
-1			1.86	-.54
0	I	2.27		
1			2.26	-.01
2	II	2.27		
3			2.20	-.07
4	III	2.18		
5			2.12	-.05
6	IV	2.07		
7			2.07	0
8	V	2.02		
9			1.99	-.03
10	VI	1.95		
11			1.92	-.03
12	VII	1.92		
13			1.90	-.02
14	VIII	1.89		
15			1.90	+.01
16	IX	1.90		
17			1.88	-.02
18	X	1.88		
19			1.87	-.01
20	XI	1.87		
21			1.82	-.05
22	XII	1.82		
23			1.81	-.01
24	XIII	1.85		
25			1.83	-.02
26	XIV	1.93		
27			1.90	-.03
28	XV	1.04		
29			1.83	-.01
30		1.80		

Generally horizontal lamellae similar to those of the north wall profile shown in Figure 6.10 are abruptly truncated by thin unoriented lamellae with no relationship to or similarity with the closely spaced horizontal lamellae of Figure 6.4. At the same time the diagnostic artifacts of Excavation Unit 1 showed this unit to yield Middle Archaic Morrow Mountain artifacts from levels lower than the Early Archaic components of the adjacent excavation unit. Early Archaic artifacts were associated with generally undisturbed horizontal subsoil lamellae. Displaced Morrow Mountain artifacts were recovered from the zone of disrupted lamellae shown in Figure 6.10.

A reasonable explanation at this juncture is to interpret the disrupted lamellae as illuvial clays which have replaced disturbed alluvial sediments. Morrow Mountain groups who frequented the floodplain may have dug pits into the medium grained sands which contained Early Archaic artifacts, scavenging those artifacts for re-use. Alternately, this disturbance could also have resulted from later cultural or natural events which overturned Morrow Mountain and Early Archaic stratigraphy.

From a sedimentological perspective, these "Morrow Mountain" pits disrupted the relatively undisturbed graded beds of the Early Archaic occupation levels. Translocated illuvial clays which would normally accumulate at the bases of graded beds were left instead as bifurcating discontinuous thin bands in a random pattern.

This demonstrated disturbance and the ensuing random lamellae distribution associated with it argue in favor of the "graded bed" hypothesis. While grain size and statistical analysis could not independently verify the presence of lamellae at the base of graded beds, it is clearly verified by the stratigraphic relationships shown in Figure 6.10. Thus, although the alluvial sediments of the T₁ alluvial fill fine upward and complicate sedimentological interpretations, the combined record of grain size differences, probabilities of paired sedimentary units, and culturally or naturally disrupted stratigraphy present a powerful argument for the presence of discrete graded beds. This argument is a major underpinning of the integrity of the stratigraphic sequence at 31Ch29 and helps account for the distribution of artifacts across the excavation. Furthermore, identification of disrupted graded beds in this unit as a possible Middle Archaic Morrow Mountain feature suggests that the pedogenic processes involved with the formation of the illuvial clays post date the Morrow Mountain occupation of the floodplain. Thus, these clays resulted from weathering which potentially began after 6000 B.P. and which may be related to the stabilization of the T₁ terrace surface at a period when it was no longer an active floodplain. Unfortunately the original "A" horizon on this surface has been obliterated by historic plowing and does not allow a detailed pedologic analysis.

Summary

In summary, our discussion of the archeological stratigraphy of site 31Ch29 and the sedimentological analysis of its associated alluvial deposits serve several purposes. We have presented this geoarcheological discussion in a form which applies both scientific methodologies and untried approaches. It is important for other researchers to note that our team was

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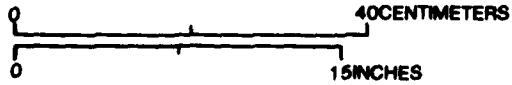


Yellowish Brown Medium-Fine
Sands (10 YR 5/4)

Dark Brown Clayey Silty Sands (7.5 YR 4/4)



NORTH



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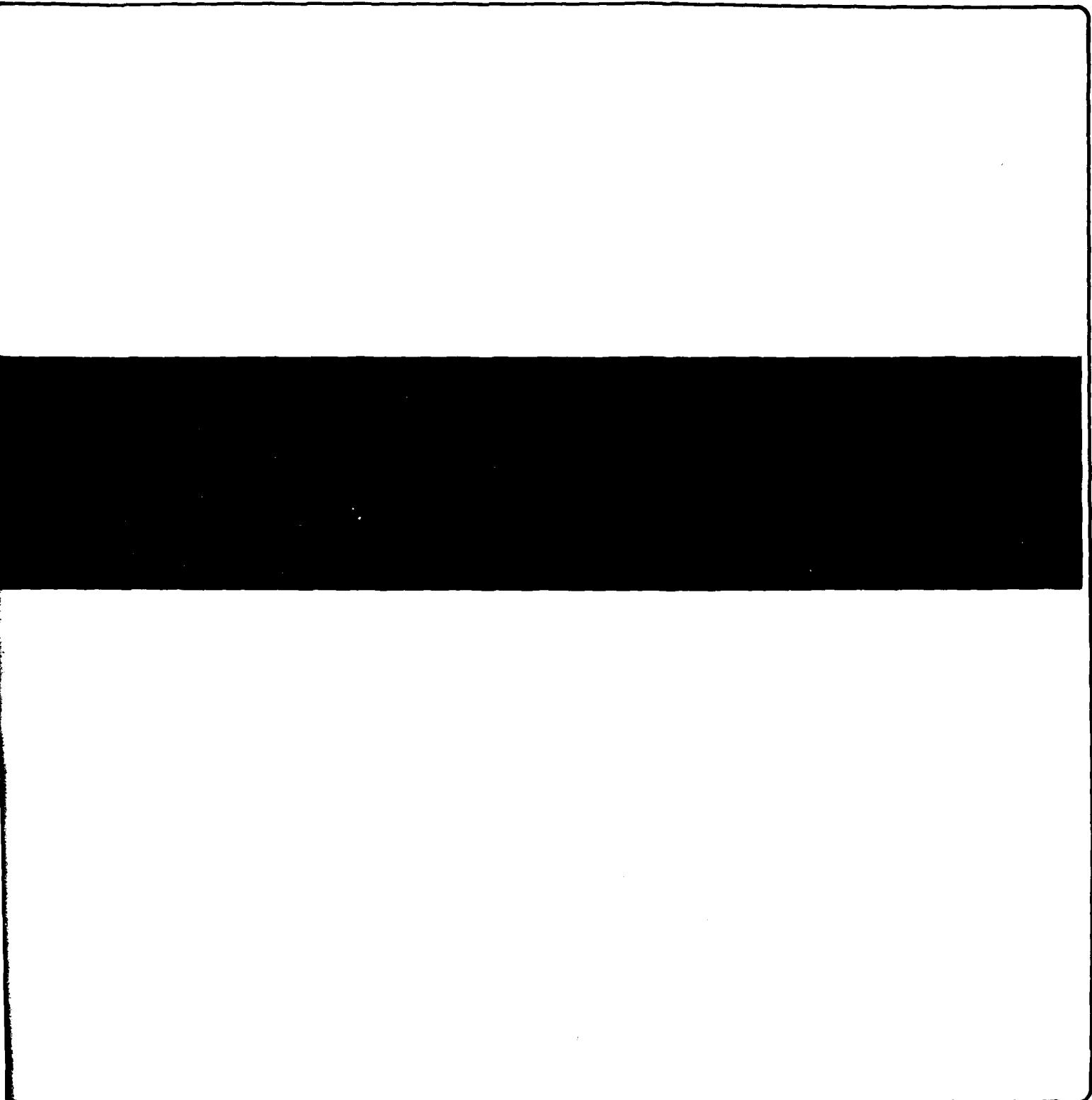


FIGURE 6.10
CULTURALLY DISTURBED
STRATIGRAPHY- NORTH PROFILE
31CH29-BLOCK A-EU1

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originally misled by what initially met our own eyes and Coe's (1964). Systematic consultation of literature further revealed that few archeological studies had dealt adequately with this type of stratigraphy. Huscher's (1964) work simply called caution to those encountering such stratigraphy. The first concrete suggestion for secondary deposition of subsoil lamellae came not from the Archaic sites of Carolina, but those of Pennsylvania and New Jersey (Kinsey 1972).

The sedimentological analysis presented here is the evolution of ideas generated by Sevon's work (Kinsey 1972), discussion with Farrand and Donahue, and study of soil science literature. From the onset of this project it has become clear that similar approaches have not been reported in the recent regional archeological literature, underlining a real need in Piedmont archeology. Second, this analysis has indicated that the stratigraphy of the T₁ alluvial fill at 31Ch29 is not unique. It defines a sequence of secondary clay deposition related to pedogenesis upon well-sorted fine to medium grained sands. The clays in and of themselves are not so critical to the fluvial or archeological interpretation of the floodplain as is the depositional environment and the grain size of the related sediments.

At site 31Ch29 two types of subsoil lamellae were encountered. These were of the illuvial sedimentary type and those of purely illuvial origin (cf. Dijkerman et al. 1967). The former type occur at the bases of discrete graded beds of fine to medium grained sands. As such, they identify the general disposition of natural stratigraphic units, which although potentially disrupted by cultural or other postdepositional agents, mark periods of episodic flooding along the Haw River during the Late Pleistocene and Early to Middle Holocene.

Illuvial lamellae can be identified at 31Ch29 in areas of disturbed sediment where graded beds have been homogenized by human or natural activity. These lamellae can be identified by their common bifurcating patterns and apparent lack of continuity across large areas of the site. Bifurcating lamellae should provide an immediate alert to the presence of disturbed stratigraphy.

The verification of graded beds through sedimentological analyses along the Haw River has furnished needed control in developing an alluvial and archeological model for not only this floodplain, but for similar floodplains as well. For example, detailed archeological interpretation need not be abandoned because of a "false stratigraphy" or because lamellae are of secondary origin. Rather, a more cogent explanation for both natural changes and archeological context may be obtained by recognizing the specific type of illuvial deposits present in a site. This can only be accomplished through detailed stratigraphic and sedimentological analyses. Drawing apparent stratigraphic analogs from this to other sites should be avoided, since without sedimentological control it would be folly to consider the subsoil lamellae of the Carolina Piedmont to represent discrete living floors. It was necessary to design a specific investigation strategy to arrive at this stage of our understanding. Thus we caution others not to overextend or oversimplify our results. On the other hand, once suitable control over the stratigraphy has been achieved, it is possible to go beyond the simple study of superimposed sediments and artifacts.

LATE PLEISTOCENE AND HOLOCENE DEPOSITIONAL PATTERNS

Site 31Ch29

The demonstrated integrity of the stratigraphic sequence exposed at site 31Ch29 provided a useful tool for studying variation of floodplain deposition along the Haw River. As Figure 6.4 demonstrates, the graded beds of the T₁ alluvial fill are approximately horizontal and relatively undisturbed across the site. While earth processes are normally considered to provide a context for archeological associations, the opposite is also true here. Figure 9.4 in Chapter 9 identifies the generalized archeological zonation of the site superimposed on the north wall stratigraphic profile of Block A. The nearly horizontal orientation of artifacts provides a valuable chronological record for reconstructing the depositional history of the T₁ alluvial fill. This control is strengthened by stratigraphic differentiation based on cultural sequences as outlined by Coe (1964), Broyles (1971), Gardner (1974), and finally by the collected radiometric and archeological analyses of Early Archaic assemblages presented by Chapman (1975, 1976, 1977, 1979).

In the Carolina Piedmont a Late Paleo-Indian through Middle Archaic archeological sequence is accurately defined beginning with the Hardaway-Dalton phase of ca. 10,000 to 9500 B.P. Successive Archaic stage phases include Palmer/ Kirk (9500-9000 B.P.), Bifurcate (9000-8000 B.P.), a possible Stanly phase (8000-7500 B.P.) and Morrow Mountain (7500-5500 B.P.). An additional Kirk phase (Coe 1964:70, 121-122) occurs chronologically between Bifurcate and Stanly or may be coeval with Bifurcate occupations; it remains poorly defined stratigraphically or radiometrically (Chapter 9).

Important archeological assemblages which represent the remainder of the Middle Archaic and Late Archaic substages include Guilford, Halifax, Savannah River and possibly Otarre. Diagnostic artifact forms, especially hafted bifaces if not complete assemblages, serve to define occupations representative of those phases which were named by Coe (1964) and have been subsequently elucidated by the other researchers (Keel 1976; Dickens 1976; Goodyear et al. 1979; Taylor and Smith 1978; Phelps 1964; Griffin 1974).

Later archeological remains were undoubtedly present in the surface strata of Block A, but were largely removed by machine prior to hand excavation. Thus, the investigated deposits of Block A relate primarily to terminal Pleistocene through Middle Holocene occupations of the Haw River terrace system. Middle to Late Holocene deposits were examined less intensively, but their potential for containing archeological materials assignable to Savannah River, Badin, Yadkin and Uwharrie occupations was demonstrated in preliminary test pits 1 through 7 of earlier UNC-Chapel Hill investigations (McCormick 1970; Wilson 1976). While combined data from Block A and the test pits provide a complete temporal record of Holocene depositional patterns, only Block A provides a clear stratigraphic and archeological record, albeit from ca. 10,000 to 4000 B.P.

Detailed stratigraphic correlation of archeological occupations (see Chapter 9) at 31Ch29 is the basis for assessing Holocene depositional rates. A total of ten distinct archeological floors ranging in age from ca. 10,000 to ca. 4,000 B.P. have been defined through correlations of lamellae with artifactual proveniences. These occupation floors and the approximate thickness of the sand deposits associated with each of them are presented in tabular form in Table 6.3 below.

TABLE 6.3
DEPOSITIONAL SEQUENCE FOR 31CH29

Lamella	Occupation Floor	Approximate Thickness of Deposit from the Base of One Occupation Floor to the Base of the Next Higher Occupation
16	Hardaway-Dalton	18 cm
15	Palmer I	15 cm
14/13	Palmer II	15 cm
12/11	Palmer III	10 cm
10/9	Hiatus	10 cm
8	St. Albans/Kirk I	10 cm
7/6	LeCroy/Kirk II	10 cm
5/4	Contact Surface*	10 cm
3	Morrow Mountain	10 cm
2	Morrow Mountain	15 cm
1	Contact Surface II**	10 cm

*Contact Surface I includes the second Stanly occupation and the first Middle Archaic floor represented by a Morrow Mountain phase floor.

**Contact Surface II represents the transition between Morrow Mountain and Later Middle Archaic occupations (Guilford and Halifax).

The sedimentary sequence shows that approximately 18 cm of medium grained sand was deposited between the initial Hardaway-Dalton occupation, which occurred on the erosional terrace surface of the Late Pleistocene sandy silts, and the base of the Palmer I occupation. Sedimentation rates may have increased after this point as indicated by the 40 cm of deposit associated with the three Palmer levels. The cultural-historical sequence for the Piedmont indicates that the Palmer occupations spanned a period of ca. 500 years and as Figure 6.9 illustrates, this period was marked by the deposition of several discrete graded beds representing repeated overbank flooding. Deposition decreased abruptly during the remaining Early Archaic periods at the site, with a net deposition of only 40 cm over a span

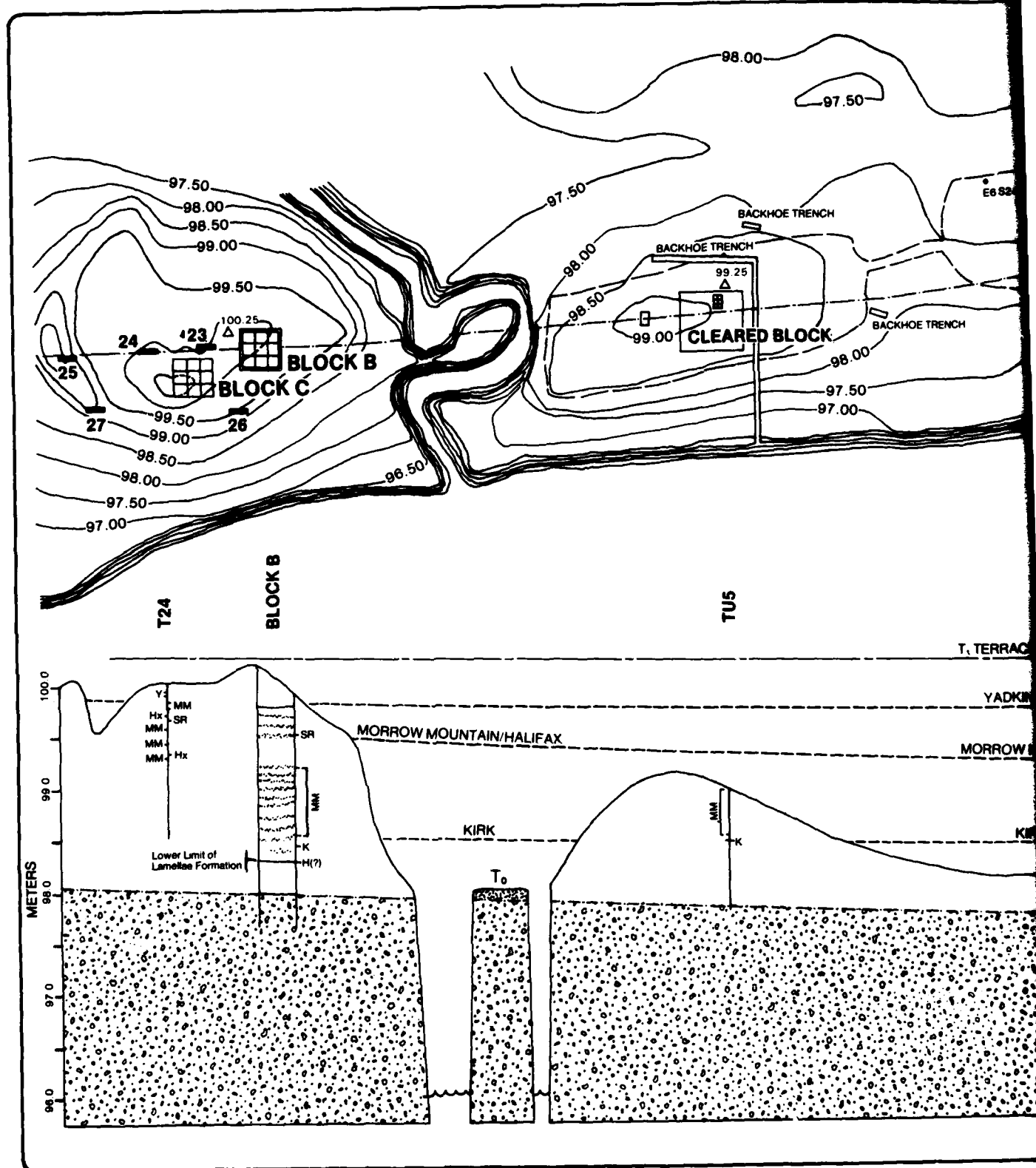
of approximately 2000 years. This sequence represented by lamella 10/9 through the Contact I surface possibly includes a depositional hiatus (cf. Chapter 9). Occupation in this zone of little or no deposition consists of St. Albans, Kirk I, LeCroy, Kirk II and the Contact I floor which includes late Early Archaic and the initial Middle Archaic (Morrow Mountain I). The relatively long period of minor deposition ended during the Morrow Mountain occupations of the site, as shown by the 35 cm of medium to fine grained sands laid down between lamellae 3 and 1, a period of about 1000 years.

A second long period of minimal deposition is marked by Savannah River type projectile points immediately overlying the Morrow Mountain component. Although only the base of a Savannah River component was preserved in Block A of 31Ch29, it has been possible to generally reconstruct this occupation through correlation of preliminary test pits. Because these pits also show some evidence of a Halifax phase occupation with artifacts at stratigraphically similar elevations, there may have been little net deposition on the surface of the floodplain between the end of the Morrow Mountain and the Halifax phases (6000 to 4500 B.P.).

Deposition following the earliest Savannah River occurrence at 31Ch29 is less well described and defined due to the spatial array of the test pits which documented the Late Archaic and Woodland components. In addition, disturbance of the upper 50 cm of the T₁ alluvial fill by plowing and clearing operations makes a detailed assessment based upon archeological dating difficult. Nonetheless, it has been possible to reconstruct a less secure and generalized depositional record.

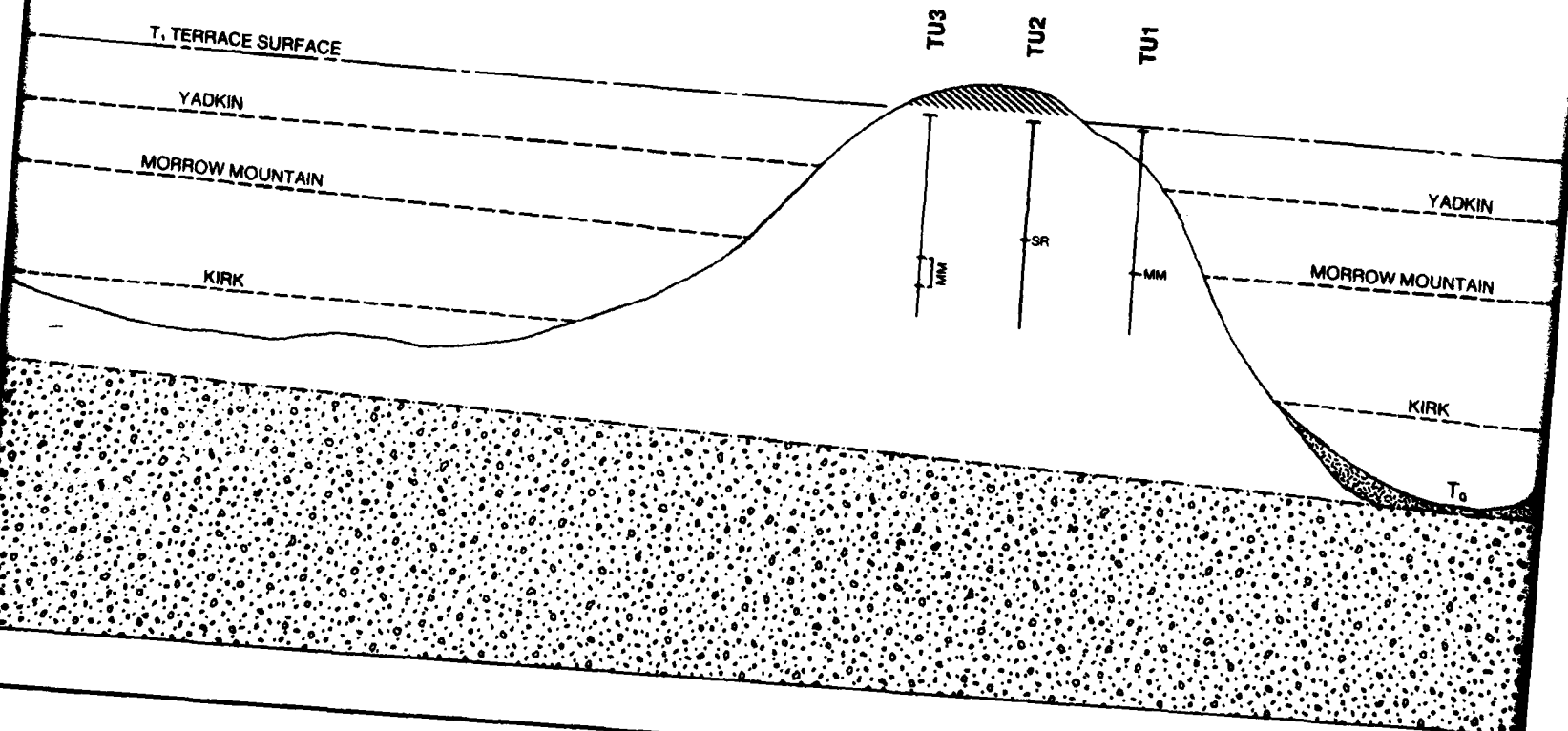
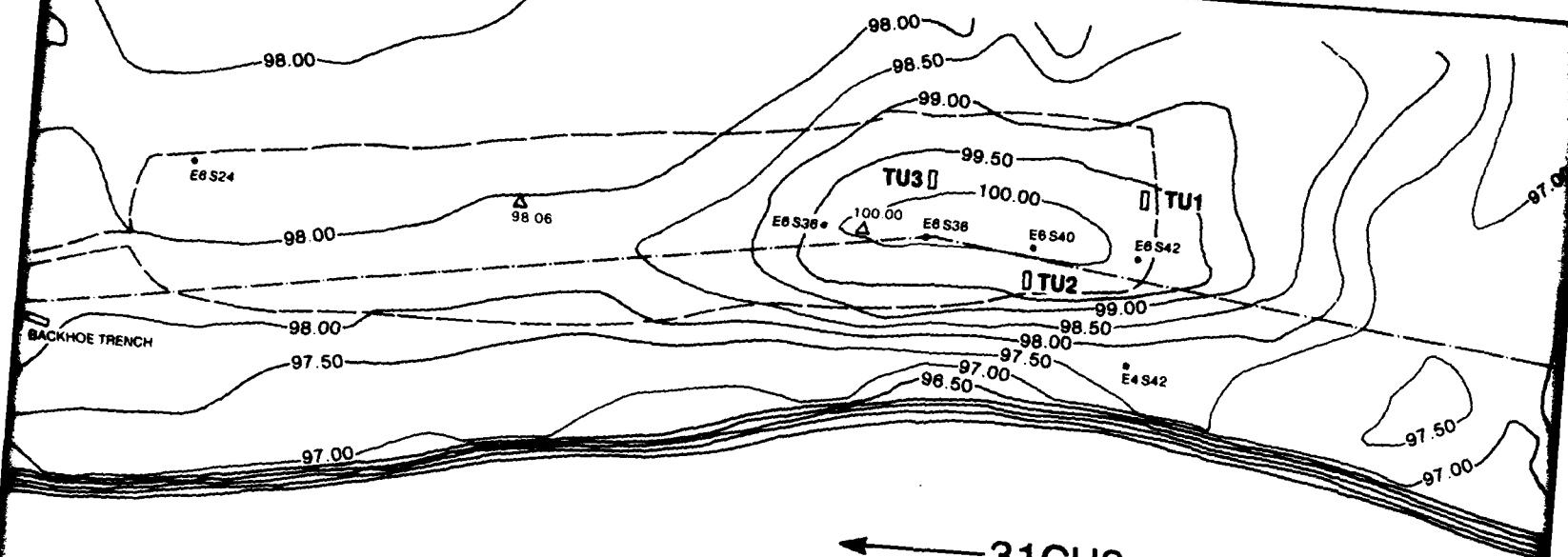
Based upon stratigraphy exposed in test pits TP-1 through TP-7 (Figure 6.11), two upper components of 31CH29 have been outlined. The first of these is the Halifax/ Savannah River component which is approximately 50 cm thick and is marked at its base by the first appearance of Halifax type projectile points and at its surface by the occurrence of Yadkin type projectile points. This broad time range spans approximately 3500 years. The absence of clearly defined Early Woodland or Badin phase artifacts suggests that only the Late Archaic time range is represented. A similar situation was observed in the Early Archaic levels where the thick Palmer-Kirk component was separated from the Morrow Mountain component by a thin intervening deposit of sands containing Bifurcate and Stanly Phase materials. Similarly, the surface of the Morrow Mountain component is marked by the superimposition of Halifax and Savannah River artifacts.

A period of 1500-2000 years separates the Morrow Mountain and Savannah River phases, and also marks a period of little or no overbank deposition. Establishing an upper limit for the Late Archaic has been complicated by the lack of a clear temporal definition of the Savannah River phase and its many variations in the southeastern and Middle Atlantic piedmonts. The Otarre phase of Keel (1976:194-196) may mark the end of the Late Archaic time range (ca. 3000 B.P.) in the southeastern Appalachians. Thus, this phase may identify a final transition from Late Archaic adaptations to those of the Early Woodland in the Appalachian Summit region.



DATA RECOVERY AT SITES 31CH29 & 31CH8
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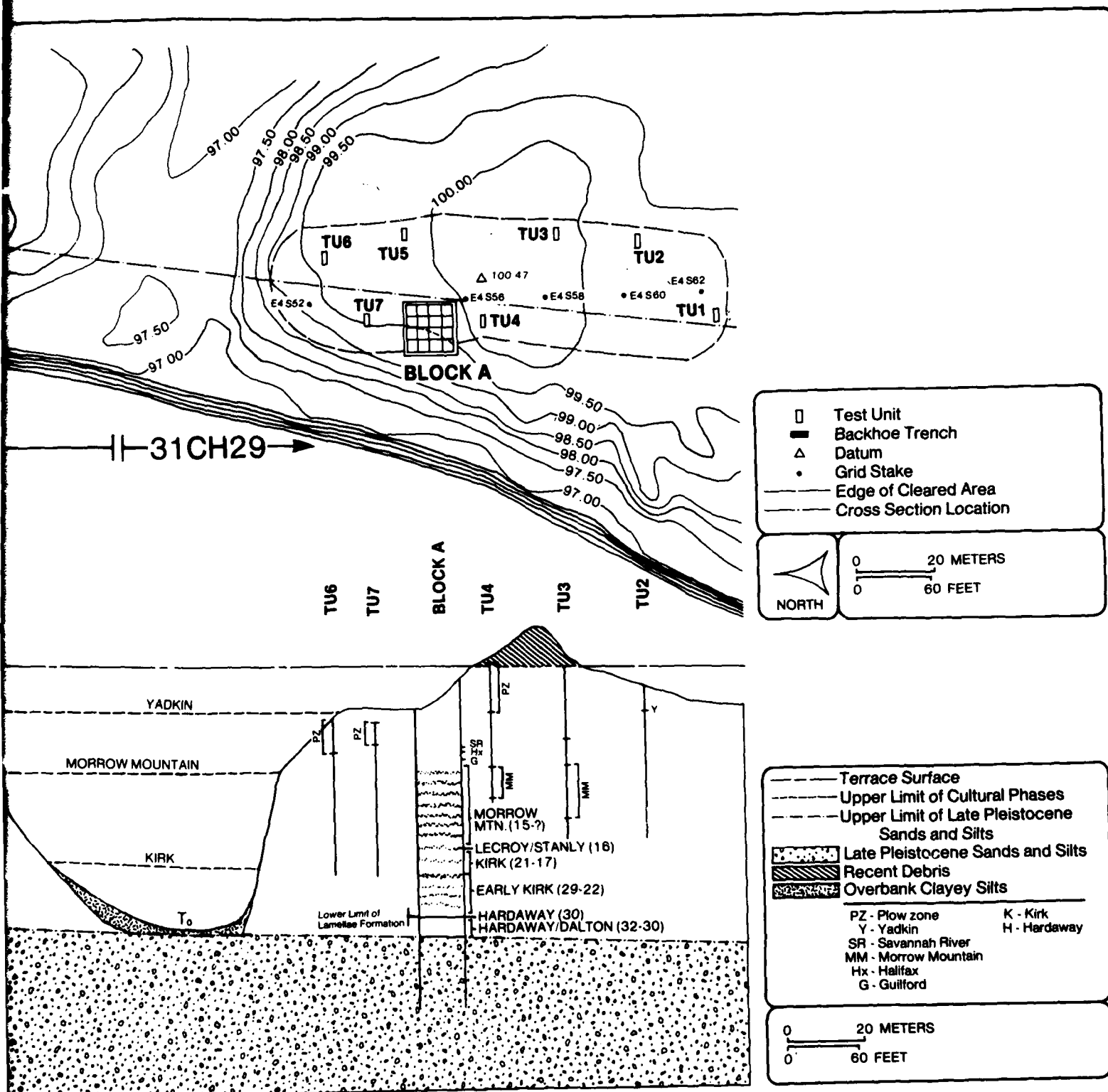


FIGURE 6.11
HAW RIVER SITE GROUP.
PLAN VIEW & GEOLOGIC PROFILE

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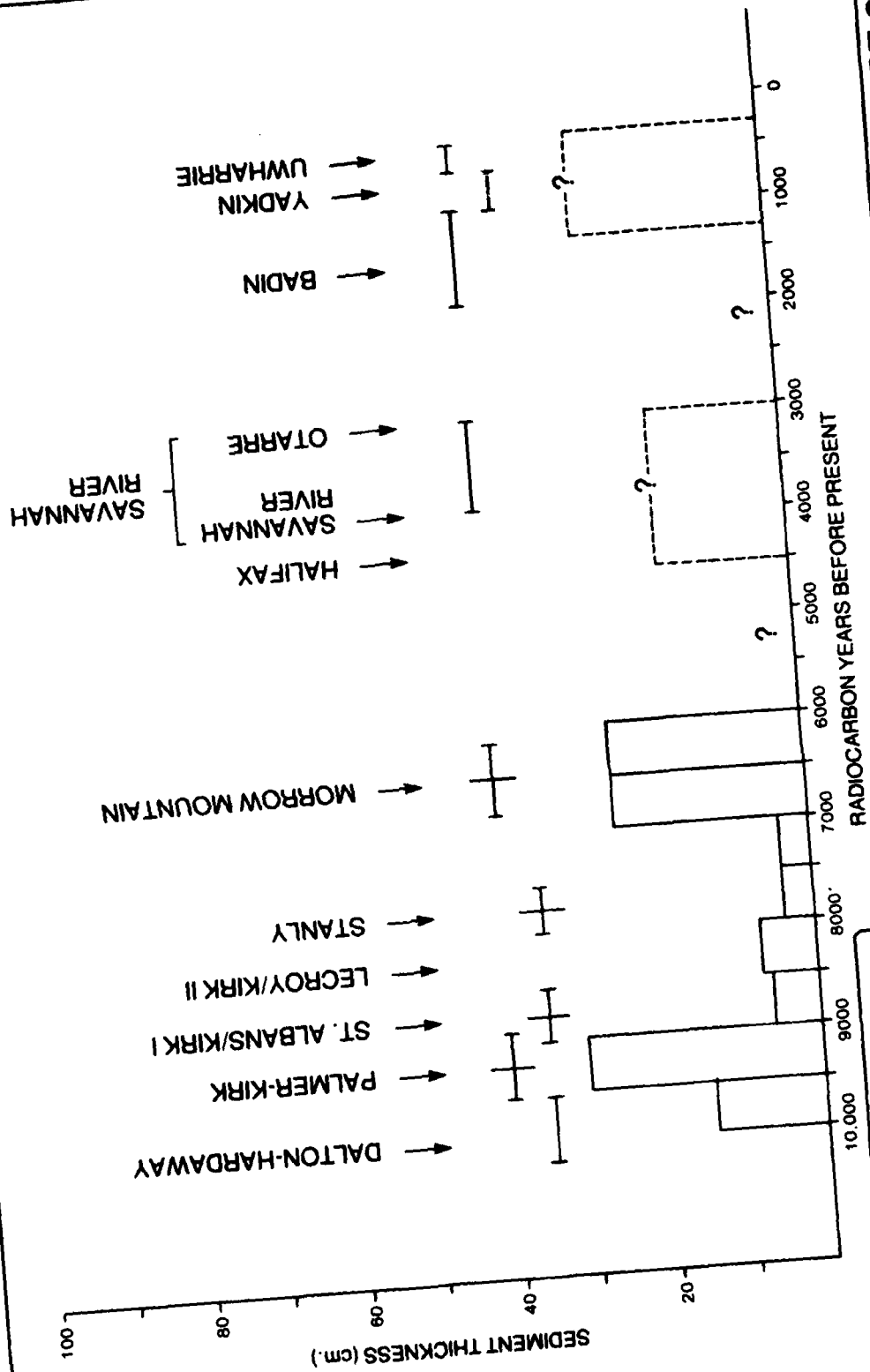


FIGURE 6.12
HOLOCENE SEDIMENTATION-
SITES 31CH8 & 31CH29

DATA RECOVERY AT SITES 31CH29 & 31CH8
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Like the earlier periods of increased deposition, that were marked by thin and successive occupations spanning broad time ranges, the Savannah River component at 31Ch29 ends abruptly. There has been, as yet, no clear definition of an Early Woodland artifact assemblage for the Carolina Piedmont (cf. Coe 1964) and no critical dating of the early ceramic Badin phase. We have assumed at this early stage of investigation that, if present, these too may be compressed into a thin horizon not vividly defined in the stratigraphic sequence. Thus, we have determined that the Halifax/Savannah River occupations took place during a period of increased deposition spanning a 1500 year range (4500-3000 B.P.) during which time approximately 50 cm of fine grained sands accumulated along the floodplain. This was followed by a suspected hiatus of 1500 to 2000 years equivalent to the Early and Middle Woodland period, when little aggradation due to overbanking took place.

Deposition resumed with the Yadkin phase (1000-600 B.P.). From the first appearance of the diagnostic artifacts, as much as 50 cm of fine sand was added to the floodplain. It is impossible, however, to posit an upper time limit to this depositional period as the surface of the T₁ alluvial fill is disturbed and contains both Uwharrie and historic artifacts. In addition, the modern Haw River no longer leaves fine sands as overbank deposits. The end of the Uwharrie Phase (600-500 B.P.) was arbitrarily chosen to mark the upper limit for this deposition. Thus, the estimated duration of alluviation over this recent period occurred between approximately 1200 and 500 B.P.

A histogram of these depositional events is shown in Figure 6.12. This graphically shows four prominent periods of high alluviation of the T₁ floodplain separated by four or perhaps five periods of little or no deposition. An episodic pattern is documented which potentially marks fluctuations in the depositional history of the former T₁ floodplain. Erosion of these alluvial deposits as an alternative explanation for the sedimentary patterns shown in Figure 6.11 can be eliminated by lack of sedimentary structures indicative of increased stream velocity. In addition, coarser grained deposits normally associated with potential isolated braided stream channels along the floodplain in post Pleistocene times are absent. This episodic Early and Middle Archaic period deposition of medium and fine grained sands is a better interpretation.

A second alternative for this episodic pattern of deposition might involve archeological dating as a biasing factor. For example, this floodplain could have been occupied on an intermittent basis, leaving behind a record of disjunct occupation unrelated to deposition. Clearly this was not the case between 10,000 and 6000 B.P. when well-defined sedimentation patterns can be reconstructed from a nearly continuous occupational history. Similarly after 6000 B.P. (Morrow Mountain phase), the mean grain size of the upper portion of the stratigraphic section continued to fine upward with generally the same progressive decrease in grain size. Thus, there are apparently no major depositional breaks. The argument favors continued alluviation of this floodplain albeit broken by intervals of erosion and/or little or no deposition.

At this stage of our research these data point to variability in runoff and/or sediment yield in the Haw River drainage basin during the Holocene. As Schumm (1969:202) has

shown, variations in these two factors strongly affect the configurations of stream channels. Aggradation can be associated with increased runoff capable of transporting a greater sediment load. Langebin et al. (1949) and Schumm (1965) show that runoff increases with an increase in precipitation, as might be expected. Runoff also decreases with an increase in temperatures because of increased evaporation and water use by plants. In temperate climates, sediment yield increases rapidly with precipitation until it is slowed by the growth of vegetation which also increases with precipitation. With the sequence of depositional intervals displayed in Figure 6.12 it is tentatively argued that the four periods of high deposition shown can be related to such precipitation and temperature changes. Periods of high deposition should be taken to indicate contemporary periods of high precipitation and runoff which in turn relate to increased sediment yield until a vegetation mat is established. Similarly, the extended periods of minimum deposition should be correlated with both potential periods of higher temperature and lower runoff and sediment yield.

Like river systems farther to the north, the Haw River appears to have undergone significant intervals of alluviation related to cooler and moister conditions in the Carolina Piedmont, while low runoff/low sediment yield intervals were possibly marked by incision of existing channels into former alluvial fills.

The explanation suggested here is one of alternative aggradation and incision of the Haw River associated with variations in temperature and precipitation. In support of this argument is the paleoclimatic record from other parts of the eastern United States. The prolonged interval of subdued deposition between 9000 and 4500 B.P., for example, is broadly contemporaneous with the Altithermal period referred to by Antevs (1946), Barry and Chorley (1970) and Knox (1976). While an Altithermal period characterized by high temperatures has not been generally recognized in the Southeast, the floodplain record presented here supports such an interpretation.

Also in support of a paleoclimatic interpretation accounting for T₁ deposition are two subsequent periods of deposition and potential incision over the last 5000 years. The Middle and Late Holocene floodplain history (shown in Figure 6.12) parallels trends in the record of alpine glacial activity in the Colorado front ranges (Benedict 1973), changes in the levels of Lakes Michigan and Huron (Larsen 1974, n.d.) and finally, the Holocene glacial record presented by Denton and Karlen (1973) for the upper northern hemisphere. Comparisons between these data and with the Haw River sequence suggest that accelerated deposition and concomitant high precipitation and sediment yield were temporally associated with paleoclimatic changes in the eastern United States.

In general, the record shown in Figure 6.12 contrasts significantly with that originally considered by Coe (1964), and accounts for those inconsistencies in his interpretation which combined overall incision of Piedmont rivers with thick Holocene alluvial sequences. The record at hand presents a more dynamic environmental system as a background to the cultural record of North Carolina. Repeated erosion and deposition have been the norm in the area, but it has been the unique depositional basin of the Indian Creek Fault Zone which has preserved an adequate stratigraphic record.

The Site Complex: 31Ch8 and 31Ch29

The detailed sedimentological analysis of site 31Ch29 has provided certain insights for further interpretation of the alluvial deposits of the entire site complex extending from Block C, 31Ch8 on the north to Block A, 31Ch29 on the south. Each new test pit and block excavated upstream from 31Ch29 exposed stratigraphy nearly identical to that described in detail for this site. In addition, the archeological sequences generally coordinated as well.

Figure 6.11 presents a longitudinal profile of the site complex parallel to the Haw River and shows our interpretation of subsurface stratigraphic relationships based upon archeological dating of the T₁ alluvial fill. The continuity of the sedimentary sequence can be reconstructed based upon the major excavations and numerous test pits placed throughout the sites. Excavation of backhoe trenches was especially useful in exposing deep stratigraphic sections at various portions of these sites.

At site 31Ch29, in particular, deep trenches excavated for the placement of a lateral drain system exposed thick sandy silt sequences and cobble and boulder lenses which make up the earlier Pleistocene (?) sediments underlying the T₁ alluvium. A minimum age for these deposits is provided by Hardaway-Dalton projectile points found *in situ* on that surface at 31Ch29. The continuity and slope of this series of fine grained sediments were more precisely defined through additional backhoe excavations at the "cleared block" shown on Figure 6.11 and near Blocks B and C. In addition, exposures of this same sandy silt were visible in the banks of a tributary stream that enters the river immediately south of Block B. As shown, these sediments are quite thick and extend at least two meters below the erosional surface shown here. Also of interest is the slope of this surface which shows a drop of approximately 50 cm between the upstream and downstream extremities of the site complex, a gradient of approximately 1 m/km.

This gradient is significant here. It is comparable with both the modern gradient of the Haw River in this area (1.3 m/km) and the extrapolated surfaces of various archeological components within the alluvial sequence. The surfaces represented by Kirk and Morrow Mountain components, for example, show an apparently similar slope across the area. A less securely dated Yadkin horizon also shows a similar gradient.

It is uncertain at this stage how these similarities should be interpreted, given the episodic record of floodplain deposition explained earlier. It is clear however, that even with long breaks in deposition the subsequent episodes of alluviation followed preexisting patterns. Those may simply represent continued deposition of relatively constant thicknesses of fine sand over an earlier erosional surface with a similar gradient. Alternatively, they may imply analogous stream regimes during periods of alluviation. Regardless of the exact explanation, it is clear that the general pattern of the T₁ alluvial fill is one of broad lateral similarity and continuity to provide such agreement in stratified archeological sequences over such distances.

Subsequent erosion of the T₁ alluvium also is apparent in Figure 6.11. The irregular topography depicted points to removal of substantial volumes of sediment from this once extensive and continuous alluvial fill. The T₁ alluvium now exists as a linear group of four isolated remnants related only by the archeological collections derived from them. Erosion apparently associated with distributary channels of the Haw River cut downward into the alluvium until the surface of the pre-Holocene silts underlying the fill was reached. This relationship is best illustrated by the swales shown in Figure 6.11 which are floored by these more resistant silty sediments.

Actual dating of this erosion interval is difficult to provide. In an earlier section we used the fragmentary stratigraphy and archeological evidence from backhoe Trench 8 to suggest that erosion of that portion of the T₁ alluvial fill occurred between 3000 and 1000 B.P. (Table 6.1). That is, in Trench 8, a paleosol developed on the erosional surface contained prehistoric ceramics provisionally dated to the Late Woodland period. In turn, the paleosol was buried by sediments containing Morrow Mountain and Halifax projectile points. This time range was admittedly loosely defined between the Late Archaic (Savannah River phase) and the mid-Late Woodland period (Yadkin and Uwharrie phases) based upon the lack of Late Archaic artifacts from the section and a probable Late Woodland identification for the associated patterning. Further refinement of this interpretation on the basis of a more detailed understanding of the artifacts and stratigraphy of the T₁ alluvial fill seems warranted. Based upon such limited data, the interpretation cannot be extended.

The record of episodic deposition presented in Figure 6.12 does suggest that incision into the T₁ alluvial fill may have occurred during periods of subdued runoff and sediment yield. Using this same argument, incision by various degrees into Holocene sediments may have taken place during each of the four intervals of low sedimentation depicted in Figure 6.12. However, the lack of a clear stratigraphic record of such episodic changes preserved in low-lying areas makes this interpretation difficult as well. While dissection of the T₁ alluvium may have been affected by episodic changes in deposition, it remains clear that dominant changes in river regime which resulted in dissection of the T₁ alluvium were Late Holocene events. A pre-Yadkin Phase erosional interval seems to be the best interpretation, but we still lack a sufficiently precise definition of Haw River ceramic sequences. Until better chronological control is obtained, it is also possible to suggest post-Yadkin erosion and incision. In any event, incised Late Holocene distributary channels have been filled with overbank deposits of clayey silt which postdate the T₁ sediments and must certainly be the results of deposition during the past few centuries (cf. Trimble 1974).

Summary of Deposition Patterns

In Late Pleistocene times, the depositional basin provided by the Indian Creek Fault Zone was floored by sandy silt deposits of probable Early or Middle Pleistocene age. This exposed surface was the remnant of an earlier depositional phase along the Haw River valley. The surface of this unit was apparently exposed to erosional processes and weathering for as long as a millennium. This is suggested by the occurrence of Hardaway-Dalton and Clovis projectile points on the stratigraphic horizon.

Beginning in Hardaway-Dalton times and extending until at least 9000 B.P., a broad fan of medium grained sands was deposited at the mouth of the constricted channel of the Haw River at its intersection with the fault zone. Overbank flooding related to increased runoff and sediment yield left behind layers of fresh sediment intermittently exposed to human occupation by Palmer and Kirk phase peoples.

This period of extensive accretion of the floodplain ended abruptly about 9000 B.P. and was followed by a long interval of minimal aggradation suggesting subdued overbank flooding. Grain sizes of sediments, however, changed little from the preceding period of heavier deposition possibly suggesting fewer flood events, but with stream velocities similar to the pre-9000 B.P. depositional phase. This period of subdued deposition or less frequent overbank flooding lasted for approximately 2000 years or until 7000 B.P. when renewed growth of the floodplain began. As with earlier alluvial events, the grain size of this relatively thick depositional unit shows few appreciable differences from the underlying units. In contrast to the preceding period of subdued deposition, the period 7000 to 6000 B.P. probably experienced a greater frequency of overbank flood events. The resulting deposition incorporates evidence of Morrow Mountain archeological occupations.

By the end of this depositional phase a broad expanse of sediment between 1 and 1.5m thick filled the depositional basin at the mouth of the constricted river channel. By 6000 B.P. overbank deposition seems to have ceased, leaving the surface of the sedimentation basin exposed for as long as 1000 to 1500 years. During this time the floodplain was sporadically occupied by groups using Guilford and Halifax artifact forms. The interval may have been accompanied by greatly reduced runoff and sedimentation which allowed the river to follow its main channel which presently bisects the sedimentary basin at the fault zone.

Following Late Middle Archaic occupations of ca. 5000 to 4500 B.P. overbank flooding resumed once more leaving behind relatively thick deposits of fine sands which contain Late Archaic Savannah River Phase artifacts. After a moderate interval of deposition, the Late Archaic component was apparently directly overlain by additional fine sands containing evidence of Badin and Yadkin phase Woodland occupations. We have interpreted this archeological gap in the record, along with an apparent break in sedimentation, to represent an interval of no overbank flooding, tentatively defined from 3000 to 1500 B.P.

Artifacts archeologically dated as Middle to Late Woodland dominate the upper few centimeters of the terrace surfaces as well as the erosional slopes near Test Unit 3 (refer to earlier discussion of geological Trench 8). This evidence points to additional deposition of fine sands during Middle and Late Woodland times. Subsequent incision of the Haw River into the Pleistocene (?) silts below the T₁ terrace and alluvial fill accompanied by an apparent change in sedimentation patterns follows the Yadkin Phase.

The exact nature of this change is still unclear; however, stratigraphy exposed in Commonwealth's geological test trenches and clearly shows clayey silts deposited in channels incised into the T₁ fill and overlying the eroded flanks of the fine sand body.

TABLE 6.4

LATE PLEISTOCENE AND HOLOCENE DEPOSITIONAL PATTERNS

ca. 12,000-10,000 B.P.	Surface of Pleistocene (?) silt deposits exposed to weathering along the Haw River. Occupation by Clovis (2) and Hardaway-Dalton hunting groups.
10,000-9000 B.P.	Increased runoff in Haw River drainage with related increase in sedimentation. Fine to medium grained sands deposited as a blanket across the Indian Creek Fault Zone. Floodplain repeatedly occupied by Kirk and Palmer Phase groups.
9000-7000 B.P.	Abrupt decrease in sedimentation followed by extended period of minimum deposition. Concomitant decrease in runoff is indicated. Human occupation is marked by Kirk I and II, St. Albans, Lecroy, and Stanly phase artifacts. Stream flow restricted to main river channels accompanied by possible incision of main channels.
7000-6000 B.P.	Increase in runoff accompanied by heavy deposition of fine to medium grained sands across fault zone. Morrow Mountain occupation is contemporary with this phase of accretion.
6000-4500 B.P.	Abrupt decrease in overbank sedimentation implying a drop in runoff and sediment yield. Virtually no deposition on surface of floodplain. Sporadic occurrence of Guilford and Halifax phase artifacts on floodplain surface. Runoff probably confined to main channels of Haw River.

4500-3000 B.P.	Increased deposition of fine sand on floodplain through overbank flooding. Alluvial deposits incorporate a record of Savannah River phase occupations.
3000-1500 B.P.	Possible period of minimal alluviation with an absence of human occupation during Early Woodland times. Major incision into T ₁ alluvial fill apparently begins about this period.
1500-500 B.P.	Final depositional phase to T ₁ alluvial fill. Fine sands incorporate Middle and Late Woodland artifacts on exposed surfaces.
500 B.P.-Present	Incision of present distribution channels and infilling by clayey silts left by overbank flooding.

Evidently the change in stream regime was sufficient to preclude further overbanking deposition of fine grained sands. Rather, the change was to clayey silts in backswamps. An alternate explanation involves the relative depths of floodwaters present. For example, deposition of fine sands on the T₁ terrace surface could imply a series of high runoff and high velocity events which left behind coarser sediments on higher surfaces while depositing only fine sediments in the ponded waters of backswamps. Such an interpretation is hampered, however by the homogeneous nature of the relatively thick clayey silt overbank deposits in backswamps.

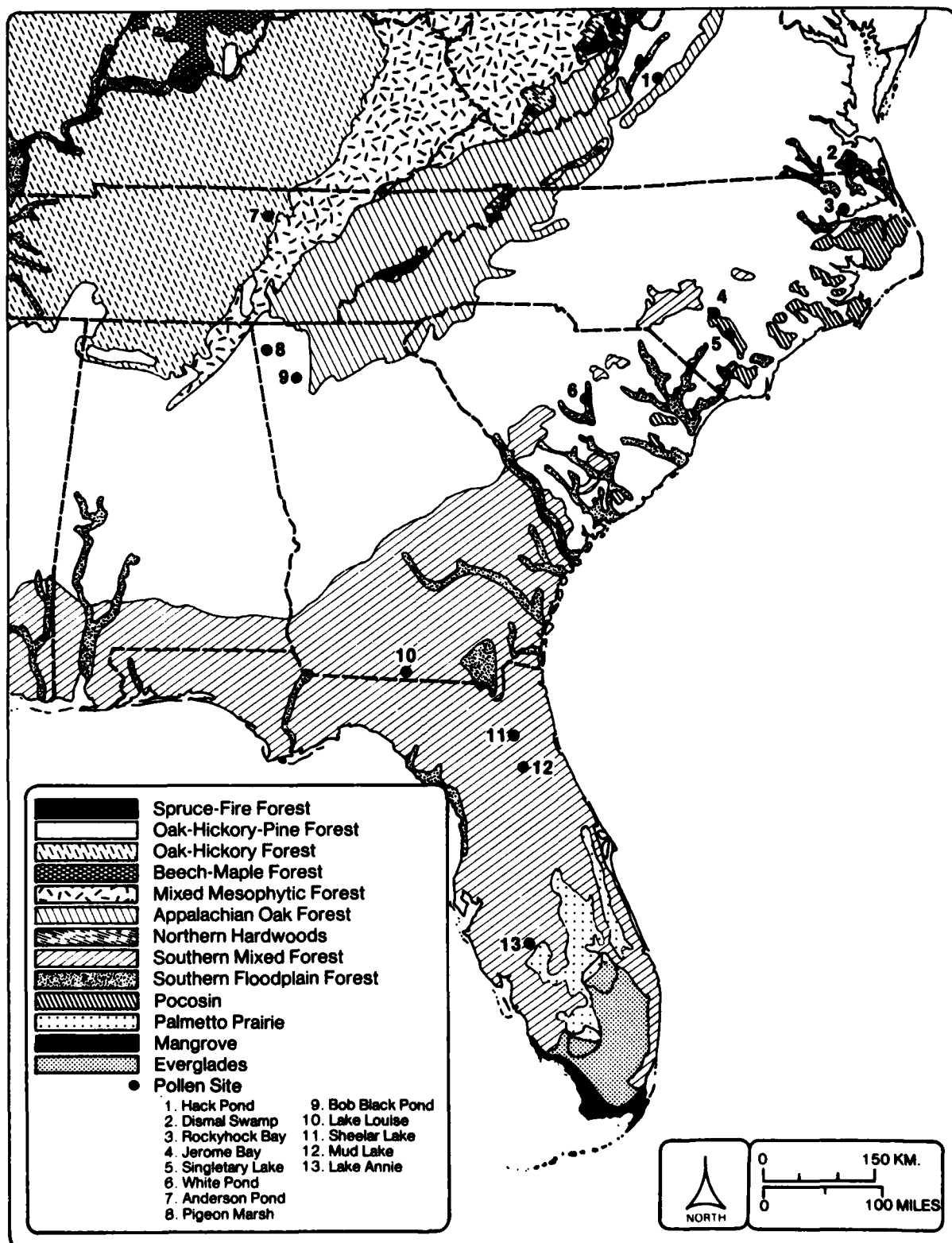
Without question the Late Pleistocene and Holocene alluvial history is more complex than presented here and outlined in Table 6.4. However, this section presents a more detailed interpretation than has been presently available for the Piedmont rivers and serves as a comparative base for future analyses of Holocene stratigraphs in this region.

PALEOENVIRONMENTAL RECONSTRUCTION

Modern Environments

The prehistoric occupation of the North Carolina Piedmont, like other areas of the eastern United States, took place against a background of changing natural environments only partially related to the suggested changes in stream runoff presented earlier. These past environmental conditions in north-central North Carolina are best addressed with reference to the present and pre-settlement conditions of the Piedmont plateau. The plateau, as well as much of the Coastal Plain, is characterized by an oak-hickory-pine forest association (Kuchler 1964). Forests of this type are identified by an assemblage of hardwoods in which 50 percent or more of the stand is usually made up of upland oaks, but in which southern pines (mainly short leaf pine) make up 25 to 49 percent of the stand. Other common associations include sweetgum, hickory and yellow poplar. Similar forest types occur as a broad band throughout the adjacent southeastern states and extend as far north as New Jersey (Figure 6.13). For the pre-settlement period reconstructed and presented by Braun (1950) this same area has been referred to as the southern evergreen forest type.

The oak-hickory-pine forest ecosystem extends eastward to the Atlantic coast in the Carolinas and Virginia, but is interspersed with pocosin and southern floodplain forests in lowlands and along major drainages (Shelford 1963). Further to the west and along the Appalachian fold belts vegetation changes to an Appalachian oak forest (Kuchler 1964). This predominant vegetation is grouped by Bailey (1978) with the oak-hickory ecosystem common to more mesophytic areas. It has a broad range extending sporadically from southern Texas to southern Maine, but most prominently defined along the Appalachian crest. In reality, these vegetation zones are not sharply bounded, but show a gradual transition from one zone to the next.



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FIGURE 6.13
POLLEN SITE LOCATIONS-
SOUTHEASTERN UNITED STATES

The generalized fauna associated with the southern evergreen or oak-hickory-pine forest ecosystem characteristic of the Piedmont plateau includes white-tailed deer, fox, squirrel, and cottontail rabbit. Game birds include mourning dove, bobwhite quail and turkey. The major proportion of the mammalian fauna, however, is made up of smaller species. The fauna of the adjacent Appalachian oak forest is quite similar, but in addition includes black bear, bobcat, gray fox and raccoon.

For the pre-settlement period, Braun (1950) would include the Blue Ridge Mountains to the West within the oak-chestnut forest regime, a classification which holds true through the first quarter of this century when blight decimated the chestnut trees. Carbone (1974) noted a correlation between various topographic features and the flora of the oak-chestnut forest. Oak and chestnut were found along steep-sided ridges while valley floors were predominantly covered with white oak. Pre-settlement fauna was doubtless more varied as well. For example, both bison and elk were reported from the Virginia Piedmont by early European explorers.

Present ecological manifestations are composite representations of the manifold environmental forces which shaped them. Because of this complexity it can be quite difficult to separate any particularly concrete process and isolate it for study. Rather, we are only able to see patterns in various collections of data. From these we can suggest the detailed environmental changes which took place in the past. Three commonly used records for reconstructing paleoenvironmental patterns are provided by geological interpretations of glacial stratigraphs to document glacial advances and retreats, geomorphological interpretation of lacustrine and fluvial landforms to suggest fluctuations in precipitation, and palynological interpretation of fossil pollen to provide a record of past vegetational changes.

For the purposes of this study, it is probably only necessary to investigate the late glacial and postglacial paleoenvironmental records as these periods encompass the generally accepted range of human occupation in the New World. This period includes only the past 12,000 to 13,000 years.

The last continental glaciation began as an ice center in the Hudson Bay region. Ice spread southward into central Canada and the northern United States. Major lobes of glacial ice covered the Great Lakes basin as well as the northeastern United States. In late glacial times the front of Wisconsin age ice extended into northeastern Illinois, northern Indiana and Ohio, northern Pennsylvania and New Jersey. The last major glaciation began about 15,000 years ago. It did not extend into Virginia or North Carolina, rather, it spread southward from Lake Erie, but was blocked by the higher topography of the Appalachian Mountains in northeastern and northwestern Pennsylvania. Ice was diverted further to the south into the lowlands of Ohio and New Jersey. A polar climate prevailed over much of the central and southern Appalachians, however (Flint 1971). Periglacial phenomena such as ice wedges and patterned ground, normally associated with tundra regions, are in evidence in various areas of the Appalachians. Thus, at the height of the last glaciation, between 15,000 and 11,000 years ago, the mountainous regions of the central Appalachians were exposed to vastly different climates and ecosystems than at present. During this 4000 year period,

continental glaciers underwent a fluctuating retreat to the north and were gone from the Great Lakes Basin by the latter date. This southward shift in polar climates associated with glacial ice fronts should also be expected to have been accompanied by polar vegetational conditions.

Among botanists, however, this type of change was not clear cut. Whitehead (1973) explains that in the 1950's two opposing points of view emerged. Braun (1950) claimed that environmental changes south of the glacial ice margin were not sufficient to generate significant displacement of biota. On the contrary, Braun considered glacial vegetation to be essentially like the present except within a few tens of kilometers from the ice front. An opposite view was taken by Deevey (1949) who asserted that effects of environmental changes during the Pleistocene were marked by significant southward displacement of boreal vegetation into the southern states accompanied by virtual elimination of most temperate deciduous forest elements from those same areas.

This debate led to increased interest in glacial and postglacial vegetation patterns of the Southeast, and agreement was difficult because of fragmentary data. Sufficient geological, and paleontological data have only begun to resolve the Braun-Deevey debate during the past 10 to 15 years. A more coherent perspective is now available and has direct application to the regional archeology.

Early work by Frey (1951, 1953, 1955) on lacustrine cores from Singletary Lake and Jerome Bay (Figure 6.14) in Bladen County North Carolina provided new insights. From these cores Frey presented a fossil pollen assemblage representing approximately 40,000 years. The proposed full glacial pollen assemblage was characterized by high percentages of pine and spruce pollen which bore little resemblance to that of the modern southeastern pine forest. In addition, virtually no deciduous pollens were present. Frey's work clearly and succinctly pointed to the existence of a boreal, pine-spruce forest in southeastern North Carolina during full glacial times.

Subsequent pollen studies from the Southeast have since corroborated Frey's work and have added increased radiocarbon dating of pollen sequences along with more detailed palynological data. Braun's (1950) position has been rendered untenable in light of these new data. Thus the Southeast has been the scene of repeated changes in vegetation, and corollary changes in associated fauna, during the several glaciations of North America.

Frey's work led to further investigations by Whitehead (1965, 1967, 1973) of pollen sequences from Rockyhock Bay, a similar lake in northeastern North Carolina (Figure 6.14). An analogous glacial jack pine/spruce vegetation was identified in this location as well. Whitehead (1973) also noted that at an early stage of research there was clear evidence for distinctly boreal species along the eastern Coastal Plain. Low pollen accumulation rates recorded for the bay lakes also pointed to a subdued pollen rain implying that the boreal vegetation was more of a parkland with open patches.

Research on similar full glacial vegetation zones was carved out over the past decade by a variety of later investigators. Boreal vegetation records were subsequently reported by Craig (1970) from Hack Pond in the Shenandoah Valley of Virginia, Bob Black Pond in northwestern Georgia (Watts 1970) and Anderson Pond in north-central Tennessee (Delcourt 1978). During full glacial times at the more northerly location at Hack Pond and Rockyhock Bay both spruce and pine were abundant, while pine generally exceeded spruce in the southern ponds. As an example of the southern spread of boreal vegetation, white spruce macrofossils and pollen have been reported from the Tunica Hills of Louisiana (Delcourt 1977). White spruce cones dated to $21,300 \pm 400$ B.P. have also been reported from Pennington, Georgia by T. Ager (personal communication).

Further attempts at providing a full glacial reconstruction for the southeast were made by Whitehead (1973) who, on the basis of then current studies, proposed a generalized zoning of full glacial vegetation types across the south-central portion of the country. This reconstruction (Whitehead 1973:628), indicates a narrow zone of tundra and taiga vegetation immediately south of the glacial ice front with spruce dominated boreal forest extending from New Jersey to northern North Carolina. Further to the south the spruce forest zone changes to a jack pine dominated boreal forest. This relatively broad band extended as far south as central Georgia and Alabama. Deciduous communities were thought to occupy the southern coastal region and Florida.

In a recent paper, Watts (1980a) added to this reconstruction by presenting additional pollen cores from Florida and South Carolina. He was able to present vegetation records for a latitudinal transect extending from south-central Florida (Lake Annie, Watts 1975; Mud Lake, Watts 1969; and Sheelar Lake, Watts 1980b) through central South Carolina (White Pond, Watts 1980a) and northward including the North Carolina and Virginia sites discussed above. Watts' most important new information for the full glacial reconstruction came from Lake Annie (Figure 6.14) which showed a predominant vegetation characterized by rosemary shrubs and dated between 37,000 and 13,010 B.P. This type of shrub vegetation was considered indicative of a very dry climate. Overlying and succeeding this shrub zone in the core was a record containing oak and ragweed pollen. This vegetation association persisted until 4715 B.P. when the modern flora of pine, myrtle and live oak scrub occupied the area.

A cold, dry full glacial climate is also suggested by Whitehead. He proposes that "... winter and summer temperatures were respectively about 15°C and 9°C colder than at present" (Whitehead 1973:629). Whitehead also sees a dry full glacial climate for coastal North Carolina where there is evidence of parabolic dunes formed during full glacial times and derived from sediment from the Pee Dee River. Similar dune fields are also present north of the Cape Fear River. Such an arid phase is also attested in the pollen record of Singletary Lake where there is an increase in the sand fraction during full glacial times.

It is clear then that southeastern paleoenvironments were little related to present conditions during the maximum extent of Wisconsin glaciation. The manner in which this spruce-pine boreal forest changed through the post Pleistocene period to form modern vegetation associations and ecosystems is more informative for archeological studies.

Changing patterns in the Holocene pollen record have been discussed for the north-eastern United States by Bernabo and Webb (1977) and for the eastern United States by Davis (1976). Both studies rely heavily on pollen records from the Northeast and Great Lakes region while the Southeast is represented by only fragmentary data. In both studies the changing vegetation patterns can be summarized by the following events in the Northeast and Canada as summarized by Bernabo and Webb (1977:90).

1. progressive shrinkage of the late-glacial boreal forest between 11,000 and 8000 B.P. to a narrow band just south of the ice sheet with the redevelopment of a more extensive northern boreal forest after 7000 B.P.
2. expansion of the area dominated by pine from a restricted region in the east at 11,000 B.P. to a wide belt from Minnesota to New England by 9000 B.P. and subsequent displacement of the pine dominated forests as oak dominated deciduous forests moved up from the south.
3. a continuously changing composition of the deciduous and conifer-hardwood forest regions caused by successive immigrations of taxa from the south throughout most of the Holocene.
4. progressive expansion of the region dominated by birch, maple, beech and hemlock trees within the Midwest from 7000 to 2000 B.P.

These authors outline a time-transgressive spread of dominant forest associations from the terminal Pleistocene and through the Holocene. Although it is technically improper to speak of forest zones because of the complexity of forest successions by various species, it is still informative to view postglacial vegetation changes from the general perspective of dominant zones. Bernabo and Webb (1977), as well as Davis (1976), outline the northward migration of a spruce-pine boreal forest. This same forest type was present in the Southeast as late as 12,800 B.P., as indicated by Watts (1980). As Davis suggested on more fragmentary data, the northward migration of the boreal forest, presumably accompanied by associated fauna as well, was a continuing wave spreading from the Southeast.

Other time-transgressive vegetation zones of the northern states are also in evidence in the south. For example, various pollen cores shown in Figure 6.14 show evidence for a relatively rapid change from boreal forest vegetation to a northern deciduous forest including beech, maple and hemlock but often dominated by oak. This brief transition was followed by development of oak-hickory forest associations. These subsequently gave way to modern southern oak-pine forests throughout Georgia and Virginia.

Figure 6.14 has been prepared from selected pollen core data discussed in this section to provide a latitudinal transect of vegetation types from Lake Annie in south-central Florida to Hack Pond in north-central Virginia. The generalized pollen zones for each core are based upon radiocarbon dated horizons. These pollen records are shown opposite the

paleoclimate trends of the Great Lakes region suggested by interstadial glacial advances (Frey and Willman 1970, Evenson et al. 1976) and fluctuations in the levels of Lakes Michigan and Huron. A Piedmont archeological chronology based on Coe (1964) and the present study is given for similar comparison.

The spruce-pine/oak dominant horizon is clearly marked in all but the Lake Louise core. This dated time-stratigraphic boundary occurs at $13,010 \pm 165$ B.P. at Lake Annie, $12,800 \pm 190$ B.P. at White Pond, $10,224 \pm 510$ B.P. at Singletary Lake, approximately 11,000 B.P. at Rockyhock Bay, and at Hack Pond at about 9500 B.P. The development and spread of the southern oak-pine forest is less well displayed with time-stratigraphic boundary at $9500 \pm$ B.P. at White Pond, about 6800 B.P. at Rockyhock Bay, and about 5500 B.P. at Hack Pond. Once again the time transgressive spread of oak-pine forest from the south-east is plainly displayed. Broadly similar forest types have prevailed in these areas through the remainder of the Holocene. The clear impression is one of progressive retreat of environmentally specific vegetation with the continued waning of glacial ice in the north. This implies a progressive postglacial warming trend to account for such changes.

The nature of this postglacial warming trend has been reconstructed by Dansgaard et al. (1969) using $\delta^{16}O/\delta^{18}O$ ratios derived from stratified glacial ice from Greenland. While not directly translatable into an actual temperature record, the Camp Century ice core shows rapidly warming relative temperatures between 12,000 and 8000 B.P. This warming trend continued until about 8000 to 4500 B.P. when temperatures reached levels higher than at present. Following the latter date temperatures were somewhat cooler than the present. Superimposed on this broad trend is a record of short-term fluctuations each lasting on the order of hundreds of years.

A similar pattern of postglacial temperature change has been presented by Carbone (1977) using paleobotanical data from the Shenandoah Valley of Virginia. Carbone suggests that mean July temperatures for Western Virginia were about 71°F during late glacial times and then rapidly warmed to about 75°F by 6000-7000 B.P. In general, Carbone's reconstructions parallel the trends of the Camp Century core and point to a similar broad pattern of Holocene temperature changes for Virginia. Carbone (1977) also addresses patterns of relative precipitation (precipitation minus potential evaporation). In relative terms he considers there to have been about 20 inches of precipitation at 10,000 B.P. falling to as low as 6 inches between 8000 and 4000 years. Over the past 4000 years precipitation apparently rose once again to about 8 to 9 inches.

Carbone (1974), following Bryson (1970), has explained his observed paleoenvironmental data in terms of a European pattern of rapid step-like changes in the paleoclimatic record. The descriptive-terminology is presented in Table 6.5.

TABLE 6.5

EPISODIC MODEL OF LATE PLEISTOCENE AND HOLOCENE CLIMATES

Date BP	Episode
260	Sub-Atlantic
1690	—
—	Sub-Boreal
2890	—
4680	Atlantic IV
5980	Atlantic III
7050	Atlantic II
7730	Atlantic I
8450	—
9140	Boreal II
9650	Boreal I
10,500	Pre-Boreal

In general terms these episodes reflect cooler temperatures during *Boreal* episodes and warmer during *Atlantic* episodes. Carbone (1974) pointed to a close correspondence between these episodes and changes in deposition patterns along the Shenandoah River during deglaciation (cf. Segovia, Foss and Gardner 1973). There may be broader environmental implications for these episodes in the Mid-Atlantic and Southeast as our fluctuations in deposition for the Haw River show (Figure 6.12). An episode of cooling between 10,000 and 9000 B.P. closely coincides with the earliest Haw River deposition interval, while the subsequent period of diminished sedimentation between 9000 and 4500 B.P. broadly coincides with the "Atlantic" episodes.

While such broad similarities exist in the depositional records of the Shenandoah and Haw Rivers, the episodic framework used by Bryson and Carbone bears no resemblance to the record of southeastern vegetation changes shown in Figure 6.13. Bryson's scheme directly addresses northern Europe and the northern United States. For example, the Boreal I and II episodes correspond with predominantly oak forests in the Carolinas and not a spruce-pine boreal association. For this reason, such an extra-regional classification should not be used in the southeast.

Differences in the fluvial and vegetation records point to greater complexities in the environmental record and underline the limitations of the pollen record for paleoclimatic reconstruction. Margaret Davis (1976) has described the major problems of interpreting pollen sequences as direct evidence for paleoclimatic change. She argues for example, that variations in pollen may indicate different rates for the migration of different species during postglacial forest readaptations. The sudden arrival of a species cannot be solely attributed to climatic change nor can absence of a species necessarily signify unfavorable

conditions. Davis, therefore, cautions against use of the pollen record for strictly interpreting past environments — especially when based upon analogy with present vegetation patterns. While nevertheless recognizing the complexity of the pollen record it is still possible to derive a more complete paleo-environmental interpretation. Davis aids in this area of inquiry as well. In more recent work, Davis (1980) shows evidence for an extended period of higher than present temperatures between 9000 and 5000 B.P. in New Hampshire. This record of an Altithermal interval in New England is reflected by altitudinal changes in the dispersal of various temperature-sensitive vegetation types. Thus broad areal vegetation studies were able to document time-transgressive changes in vegetation association (cf. Figure 6.13). Still more detailed pollen studies, specifically designed to provide better reconstructions, are clearly required for closer identification of causative variables relating vegetation and climatic gradients.

Central to this study is Davis' study of an Altithermal interval in the northeast. Heretofore this interval has received a great amount of attention in the Great Basin and Central Plains (cf. Knox 1976). Davis identifies a similar period of maximum temperatures and potential xeric conditions in the northern deciduous and oak-hickory forest associations of the eastern United States as well. The Altithermal interval corresponds closely with the Atlantic I-IV episodes presented in Table 6.5, an interval of subdued deposition in the Shenandoah Valley (Segovia et al. 1973), along the Potomac River (Larsen et al. 1980) and along the Haw River in North Carolina. Together, combined records of pollen and geomorphological data indicate a synchronous interval of warm dry climatic conditions for the east coast of the United States. Recognition of an Altithermal interval in the Southeast as evidenced by deposition patterns introduces new evidence for archeological interpretations of the Carolina Piedmont and may suggest important paleoenvironmental influences behind Early and Middle Archaic subsistence adaptations.

A generalized paleoenvironmental reconstruction for the North Carolina Piedmont can be derived from these interpretations of the pollen and depositional records. In summary, the evidence points to a background of rapid postglacial warming accompanied by a spread of spruce, pine, oak dominated deciduous, and finally oak-hickory-pine forest across the Southeast. Superimposed upon this broad trend of climatic and vegetational change are numerous shorter term episodes of temperature and precipitation variations.

The faunal evidence for the late Pleistocene and Holocene is less well known for North Carolina, but collections from Virginia point to similar if not simultaneous conditions. Each of the advancing vegetation zones shown in Figure 6.13 provided habitats for related fauna. As tundra gave way to spruce/pine parklands in the central Appalachians, an essentially Canadian fauna was common in Virginia. This fauna migrated northward with the retreating cooler habitat. In the modern boreal forest environment the Canadian fauna is represented by moose, woodland caribou, lynx, marten, black bear and white-tailed deer (Garrison et al. 1977). At the end of the Pleistocene, however, this fauna was quite different. Guilday (1962) shows that a larger fauna existed. Near Saltsville, Virginia this fauna consisted of long armed ground sloth (*Megalonyx jeffersonii*), mastodon (*Mammut*

americanus), woolly mammoth (*Mammuthus primigenus*) bison (*Bison* sp.) and musk ox (*Bootherium* sp.). This collection was dated to $13,460 \pm 420$ B.P. Carbone (1974) quoting Guilday (1962) notes that this late glacial fauna seems to have persisted in northern Virginia until at least $11,300 \pm 1000$ B.P. A modern temperature faunal assemblage was present in the region by 9340 ± 1000 B.P. (Guilday 1967). Thus the northern faunal assemblage including Pleistocene megafauna had completely given way to a nearly modern fauna within a span of 2000 years.

In the Shenandoah Valley this change in faunal type appears to coincide temporally with a change from northern conifer and deciduous forest to predominantly oak forest (cf. Craig 1969). The lack of a comparable fossil record for the Carolinas makes a direct connection between the faunas and the major vegetation types impossible. The Pleistocene megafauna of Virginia, for example, was apparently contemporary with oak, hickory, beech and hemlock forests in North and South Carolina. While it is tempting to see a northward migration of faunas with the dominant vegetation types of the terminal Pleistocene, such an interpretation is still premature.

Geoarcheological Perspective

From the human perspective the relationship between prehistoric groups and vegetation associations is also uncertain. It would be intriguing to directly connect the evidence of prehistoric populations with changing vegetation associations along the Atlantic coast. Unlike the faunal evidence where few data collections exist, the archeological record is more complete. Dincauze and Mulholland (1977:450), for example, consider vegetation successions in explaining early prehistoric demographics. They postulate a time-transgressive spread of Early and Middle Archaic prehistoric groups into New England to be related to the northward spread of oak forest. In support, they see Early Archaic evidence in southern New England and Middle Archaic sites as far north as southern New Hampshire and Vermont. While this scheme is admittedly attractive, such a close dependence on oak dominated deciduous forest as a subsistence base totally governing population distribution is not wholly acceptable.

In Paleo-Indian times, for example, there is widespread evidence for fluted points from the Southeast to New England and Nova Scotia. If the presence of Clovis points can be taken as a cultural time marker, Clovis or similar groups existed in oak forests in South Carolina (Williams and Stoltman 1965) at the same time that they exploited spruce pine parklands in the Hudson River Basin in New York (Funk 1977). A similar comparison could be made between the Hardaway-Dalton occupations of the Southeast with potentially simultaneous Dalton-like occupations in the lower Hudson Valley (Brennan 1977:415). Clearly these prehistoric populations cross-cut dominant vegetation zones; on the other hand, the artifacts may not represent chrono-cultural markers.

In 1962, Mason (1962:245) postulated that the widespread distribution of Clovis points reflects the habits of newly introduced hunters from Asia who pursued migratory "big game." Williams and Stoltman (1965) considered this spread of Clovis fluted points to represent a rapid filling of the continent from the Northwest related to migratory game habits and the absence of competition from prior human inhabitants. These writers had little knowledge of the southeastern vegetational history when they presented their ideas. The fauna normally associated with Paleo-Indian hunters (mammoth and caribou) may have been a varied one equally adapted to the spatially different ecological patterns. Cultural adaptations may equally well explain these broad ranges.

Gardner (1974, 1977), describing the Clovis and late Paleo-Indian occupations at the Flint Run Site in Virginia, suggests activities as determinants for central locations for early settlement and subsistence rather than solely paleoecological variables. Throughout the Paleo-Indian period, Virginia-based hunting groups continued to return to a fixed strategic resource as a central place. H.T. Wright (1981) has carried this theme still further. In the Great Lakes area evidence also points to the source of lithic raw materials as the locational attraction for hunters using Bull Brook or Barnes fluted point industries. Bull Brook points in Michigan are made of Mercer Chert and are found up to 350 km from the central source area. The late Barnes points, on the other hand, are of local Bayport Chert. Barnes points remain within 170 km of the lithic source area in this case. In each of these cases raw material sources are the central focus and as Gardner suggests these were predictable resources unaffected by ecological changes. Wright's findings point to important cultural changes through time. He postulates that the decreasing distances from lithic source areas by Bull Brook and Barnes hunters shows a reorganization into territories. This provides a general view of early wide-ranging Clovis hunters, centered about lithic sources, giving way through time to groups with reduced subsistence ranges and local territorial areas. In each of these cases, the total territories covered through time is great and suggests no real preference for vegetational zones during the terminal Pleistocene.

This was not the case for Early Archaic hunters. Gardner (1977) has argued that the Early Archaic of Virginia and presumably the Carolinas was a direct development from earlier Paleo-Indian antecedents. He sees both groups as hunters exploiting similar resource areas. As Wright has suggested, however, there appears to have been a decrease in the area exploited through time. Thus Early Archaic groups may well have developed from Paleo-Indians, but may have been far more territorially oriented as well. In addition, Early Archaic hunters of the Carolina and Virginia Piedmonts may have been more ecologically adapted to the predominantly oak deciduous forests of the Southeast. Support for this idea comes from Dincauze and Mulholland (1977:439) who note that projectile points related to the Palmer and Kirk associations (Kirk I) of the Southeast are only rarely found in southern New England. Early Archaic artifacts associated with Kirk side-notched and Bifurcate Tradition projectile points (Kirk II), on the other hand, are found in southern New York (Brennan 1977:417-18; Funk 1977:327). Perhaps coincidentally this later Early Archaic manifestation in the Northeast may be synchronous with an oak-hemlock forest association (Sirkin 1977).

From this evidence it would appear that prehistoric groups related to Kirk II artifact associations were adapted to the ecological communities of the oak forest. The sedimentary record from the Haw River and the pollen records of New England (Davis et al. 1980) show synchronous evidence for an Altithermal interval coinciding with this change in zonal archeological distributions. The archeological sequence at Flint Run (Gardner 1974) also shows change in tool technology. Gardner (1977:261) is of the opinion that a major shift in Archaic subsistence strategies did not occur until the Middle Archaic (post 8000 B.P.) when general foraging superceded an emphasis on hunting. The environmental data suggest this transition may have occurred a thousand years earlier and may have been associated with greatly increased temperatures and reduced precipitation. The magnitude of these postulated changes in prehistoric subsistence patterns is left for a subsequent chapter; it is important, however, to point out the complexity of man-land relationships in the Late Pleistocene and Early Holocene.

From a paleo-environmental perspective, the response of prehistoric populations in the Carolina Piedmont was not a direct function of shifting ecological zones, fauna, and flora. Dynamic changes in the organizational structure of early Paleo-Indians, for example, seem to have violated a simple ecological model by allowing widespread occupation of dissimilar ecological settings. It was not until late Early Archaic times that sufficient territoriality and subsistence scheduling, based upon seasonality and ecological communities, became more firmly established. It has been largely this type of interplay between culture and ecology which has influenced the prehistoric populations in subsequent millennia in the North Carolina Piedmont.

CHAPTER 7

DESCRIPTION OF CULTURAL FEATURES — 31Ch29 and 31Ch8

Cultural features were defined during the course of excavations at 31Ch29 and 31Ch8 as discernible concentrations of tools, debitage, rock, carbonized organics (wood) or other non-natural structures resulting from prehistoric cultural activities. A total of 84 discrete activity units were designated features, numbered sequentially and given special consideration during the course of excavation. Seven test pits and the 12m x 12m major block (A) at 31Ch29 produced 70 features; 14 features were likewise recorded for seven test units and the 9m x 9m block (C) at 31Ch8. Three of the numbered features (Numbers 2, 3 and 66) at 31Ch29 were later determined to be natural disturbances (root molds). Three others (18, 28, 63) were further defined as "activity areas" rather than features and will not be described here. Of the 14 recognized features at 31Ch8, only one (Number 6) was later determined to be a modern disturbance. Feature recognition during the excavation of Block C at 31Ch8 was hampered by the fact that most of the excavation was carried out in soil zones at or near the surface, which, prior to recent vegetation removal, had supported numerous large trees and understory species. Compared to the lighter sands encountered elsewhere at the Haw River sites, soil colors and humic contents were more likely to obscure dark feature fills.

Two features (4 and 8) were salvaged during backhoe stripping of the Block A area; the former was a basin shaped stain containing a single cord-marked potsherd, while Feature 8 was a globular pit containing an Early Archaic Kirk point and several other lithic items within its ashy fill. All other features at 31Ch29 and 31Ch8 were excavated under controlled conditions.

A standard set of techniques was utilized for recovery of feature data. On encountering a possible feature, and after consultation with a field supervisor, each excavator attempted to define horizontal limits, usually by trowelling. Measured drawings and photographs were used to provide an initial visual record. The majority of features were subsequently isolated on soil pedestals, especially when charcoal or ash stains were present. This was done to facilitate eventual sectioning of the pedestal/feature and additional recording of data. Depths, dimensions and positions of fire-cracked or unaltered rocks were noted. The rocks were then removed, counted, weighed and discarded in the field. All data were listed on level sheets along with point provenience information for lithic tools, debitage or ceramics. Samples of carbon or, more commonly, ash stained soil were packaged and labelled for later examination.

Features were described in the field notes and catalogs according to outstanding morphological characteristics i.e., rock clusters, ashy stains, etc. Those somewhat arbitrary categorizations eventually were consolidated during laboratory analysis into eight mutually

exclusive feature categories. They are: ash lenses; rock clusters; rock clusters with associated ash lenses; basin-shaped pits; globular pits; fired areas; artifact caches; and ceramic sherd concentrations. Descriptions of individual feature categories from both 31Ch29 and 31Ch8 follow.

I. Ash Lenses	Length	Width	Thickness
N=17	n=15 range=12cm-125cm $\bar{x} = 55.33$	n=16 range=12cm-60cm $\bar{x} = 35.38$	n=9 range=1cm-51cm $\bar{x} = 12.44$

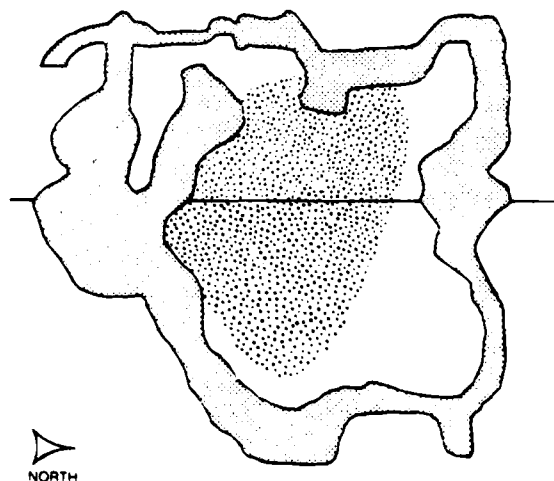
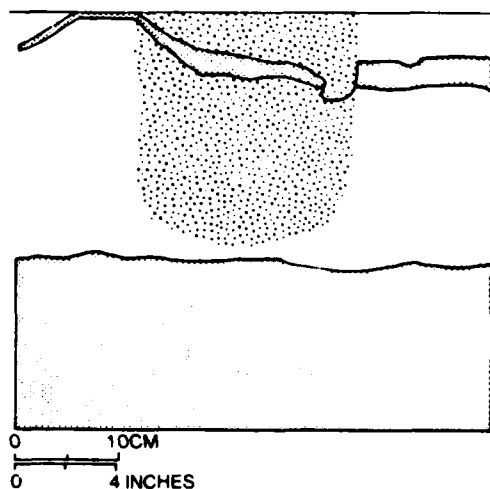
These features were recognized as grey ashy stains, approximately 5cm thick and lense-like in cross section. The plan view of such stains was circular to oval, generally well defined and exhibiting little smearing such as might result from hearth cleanout or erosion. The carbon content was predominantly ash, with only very small flecks of charcoal. Staining, caused by the leaching of ash and related to the same translocation of fine particle sizes that formed clay lamellae, extended below the actual feature in a halo-like effect and in most cases obscured the actual base of the feature. Therefore, thickness was often necessarily measured from the depth of the feature's origin to the first undisturbed beta horizon. Eleven of the nineteen stains contained small quantities of fire cracked rock, while a smaller number contained tiny pieces of burnt clay (see Figures 7.1 and 7.2).

Thirteen features of this category were found at 31Ch29, while only four were recorded at 31Ch8 (Table 7.1).

Ash lenses as a feature class appear to be the remains of ephemeral fire hearths. Their thinness and lack of accompanying intrusions through the beta horizons indicate fires built directly on land surfaces. The high ash content and very small flecks of charcoal are indicative of surface fires with an unrestricted oxygen supply.

Except for having more well defined perimeters, these ash lenses are very similar to the Type 2 hearths described by Broyles at the St. Albans site (Broyles 1971). Yellen, in his study of modern iKung camp structure and contents, notes that hearth remains were simply ash lenses with clearly defined edges, but containing very little charcoal. He suggests that shallow depressions, which in some cases contain ash, are not the result of any hearth preparation, but caused by stirring in the ashes to remove cooked food items (Yellen 1977:87).

II. Rock Concentrations	Length	Width	Thickness
N=31	n=29 range=27cm-115cm $\bar{x} = 53.66$	n=29 range=14cm-80cm $\bar{x} = 34.93$	n=14 range=7cm-14cm $\bar{x} = 11.14$



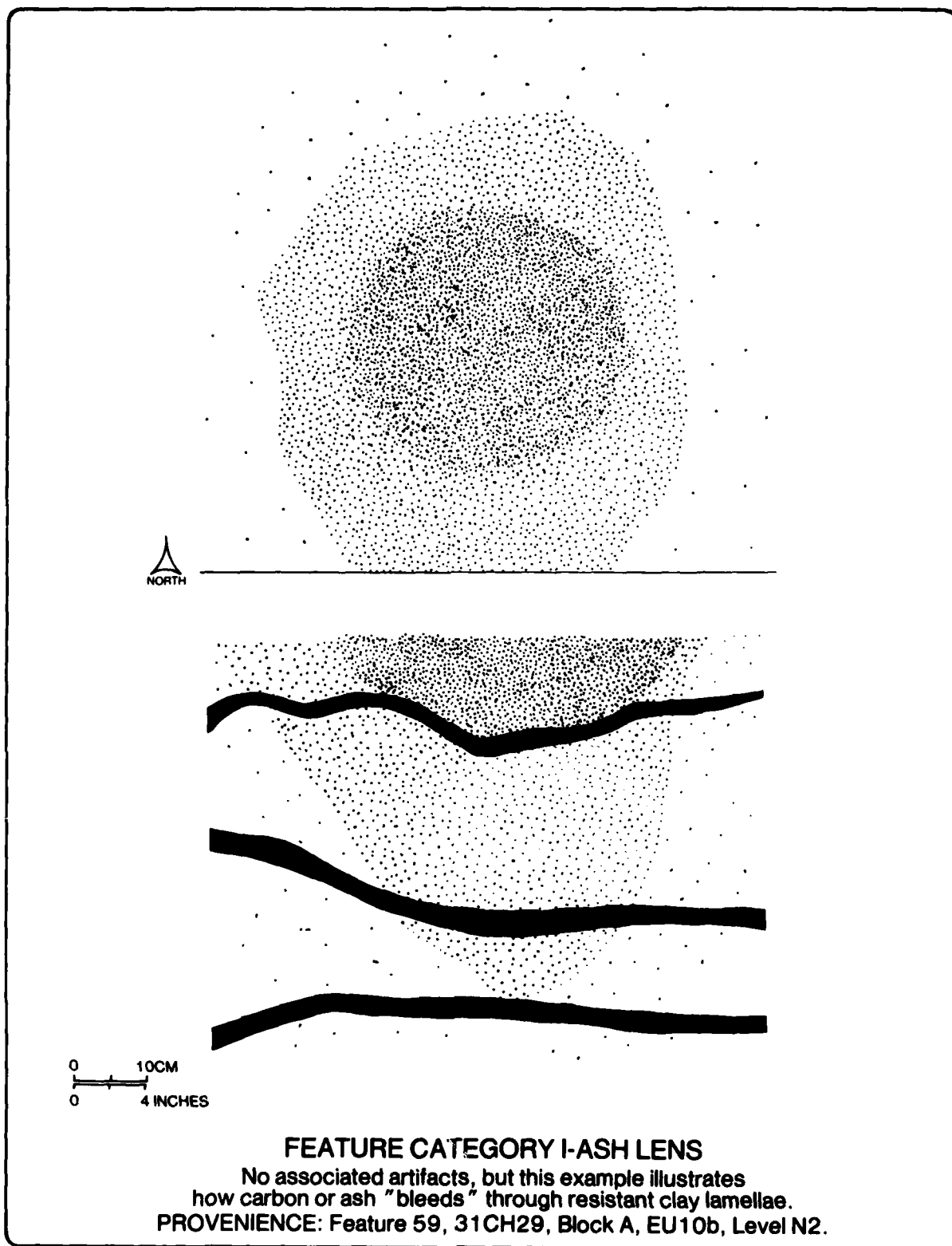
FEATURE CATEGORY I-ASH LENS

Associated artifacts include a manuport ("hammerstone")
and a chert uniface.

PROVENIENCE: Feature 30, 31CH29, Block A, EU13a, Level 28.

DATA RECOVERY AT SITES 31CH29 & 31CH8
B. EVERETT JORDAN DAM & LAKE
CHATHAM COUNTY, NORTH CAROLINA
COMMONWEALTH ASSOCIATES, INC.

FIGURE 7.1
FEATURE CATEGORY I-
ASH LENS



DATA RECOVERY AT SITES 31CH29 & 31CH8
 B. EVERETT JORDAN DAM & LAKE
 CHATHAM COUNTY, NORTH CAROLINA
 COMMONWEALTH ASSOCIATES, INC.

FIGURE 7.2
FEATURE CATEGORY I-
ASH LENS

These features were clusters of fire cracked rock, manuports, unaltered rocks or some combination of these components. Rock concentrations were the most frequently identified feature type. The denser concentrations, including those with some discernible (usually subcircular) configuration, had a rock density of greater than 2 grams/cm² up to 20 grams/cm². The more diffuse yet still definable clusters ranged in density from 1 gram/cm² to .2 gram/cm² (see Figures 7.3-7.7).

Rocks comprising the clusters were generally meta-igneous cobbles from nearby gravel beds in the Haw River. There were also blocky quartz fragments similar to those eroding from nearby hillsides, as well as some water worn quartz and quartzite cobbles such as are abundant on the older eroded terrace remnants. Fire-cracked rocks were identified according to the criteria outlined by House and Smith (1975).

Thickness of the rock clusters was determined as the distance from the base of the uppermost component to the base of the lowermost. During excavation, no depressions were noted in conjunction with rock clusters, yet, since rock clusters were not cross sectioned, depressions without staining may have escaped notice. It seems likely that the 11 clusters thicker than 10cm represent rocks placed in shallow depressions rather than vertical displacement. Rock clusters with ash lens staining (similar to feature Category I) in direct association were so infrequent and distinct that they are presented in a separate category.

The denser rock clusters, with their subcircular, sometimes ringlike, configurations and high fire cracked rock and tool densities, appear to be hearth areas, yet for the most part lacked any evidence of charcoal or ash staining. The more diffuse groupings may have been either the scattered remains of originally denser clusters or rocks purposefully removed from compact clusters as heated cooking stones or simply in the process of hearth maintenance.

These clusters appear to be analogous with Chapman's Category E (*Surface Concentration of Rock*) at Rose Island (Chapman 1975:195).

III. Rock Clusters

With Ash Lenses	Length	Width	Thickness
N=7	n=7	n=7	n=1
	range=35cm-57cm	range=20cm-44cm	range-NA
	\bar{x} = 40.33	\bar{x} = 31.33	\bar{x} = 25

Broyles (1971:23) describes similar features as Type 3, hearths with burned earth and ash. At St. Albans, Type 3 hearths were frequently associated with Early Archaic Kirk points (see Figure 7.8).

**IV. Basin Shaped
Pits**

	Length	Width	Thickness
N=6	n=6 range=28cm-130cm $\bar{x} = 61.5$	n=6 range=23cm-100cm $\bar{x} = 46.82$	n=3 range=7cm-20cm $\bar{x} = 12.33$

Six ashy stains, which were basin shaped in cross section and cross-cut clay lamellae, could be attributed to aboriginal excavation, presumably in the preparation of hearth areas. Chapman (1975:195) has described similar features in his Category C as basins containing varying amounts of rock, or no rock at all, and no fire-hardened soils (see Figure 7.9).

**V. Globular
Pits**

	Length	Width	Thickness
N=1	30cm	17cm	30cm

One ashy stain, Feature 8, was located at 99.00m in the backhoe stripping of Block A. It proved to be a globular pit containing a Kirk point and several flakes (Figure 7.10). Flotation of the fill from the pit produced little charred organic material, but did yield one hickory nut shell fragment. Chapman (1975:193) describes similar globular pits in his Feature Category B, and notes their concentration in the St. Albans and later Kirk horizons, but offers no functional interpretation.

VI. Fired Areas

	Length	Width	Thickness
N=2	n=1 92cm	n=1 77cm	n=0 NA

Feature 39, in EU6f,c Level 28, was a shallow depression in a beta horizon. The silty clay in this area was hard and very distinctly stained to a dark reddish brown with some grey ash. The depression contained flakes and a small quantity of fire cracked rock.

Feature 67 was recorded during excavation of natural levels of EU10, Block A, 31Ch29. An irregular zone of apparently fire-hardened earth (mostly clay) was associated with scattered particles of charcoal; after recovery by water flotation, those fragments yielded a radiocarbon date of 7960 \pm 90 BP (Beta-1367), the earliest date generated at the Haw River site group.

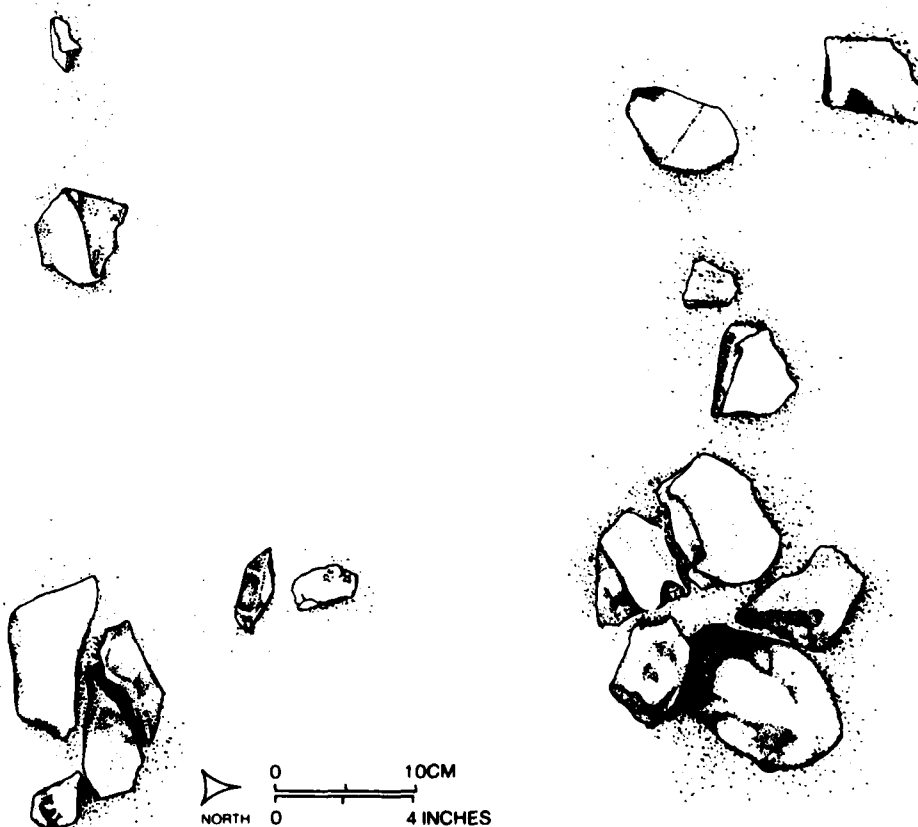
Although our sample is small (N = 2), this category appears to be analogous with Chapman's feature category of the same name. Nearly half of all features recorded at Rose Island were of this type (Chapman 1975:190). Assuming that generally similar cultural processes were at play, we would suggest that the lower occurrence at 31Ch29 is attributable to the differences in soil type which conditioned formation and preservation of such features.



FEATURE CATEGORY II- ROCK CONCENTRATION

A diffuse scatter of fire-cracked rock
and debitage.

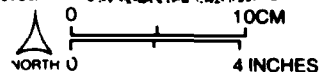
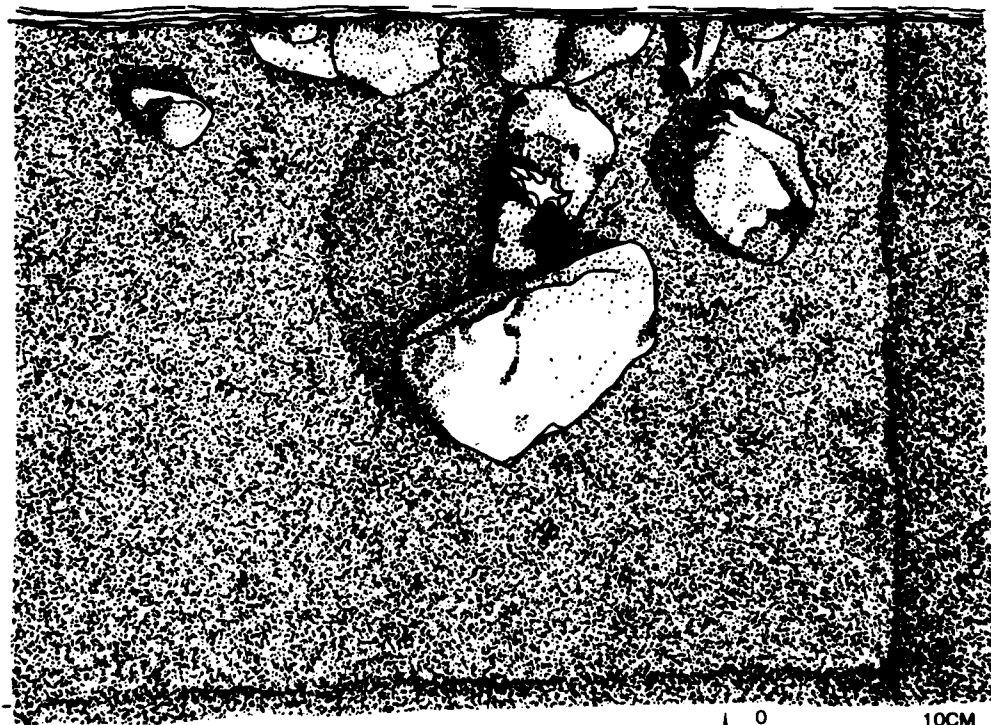
PROVENIENCE: Feature 38,
31CH29, Block A, EU14d, Level 21.



DATA RECOVERY AT SITES 31CH29 & 31CH8
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**FIGURE 7.3
FEATURE CATEGORY II-
ROCK CONCENTRATION**



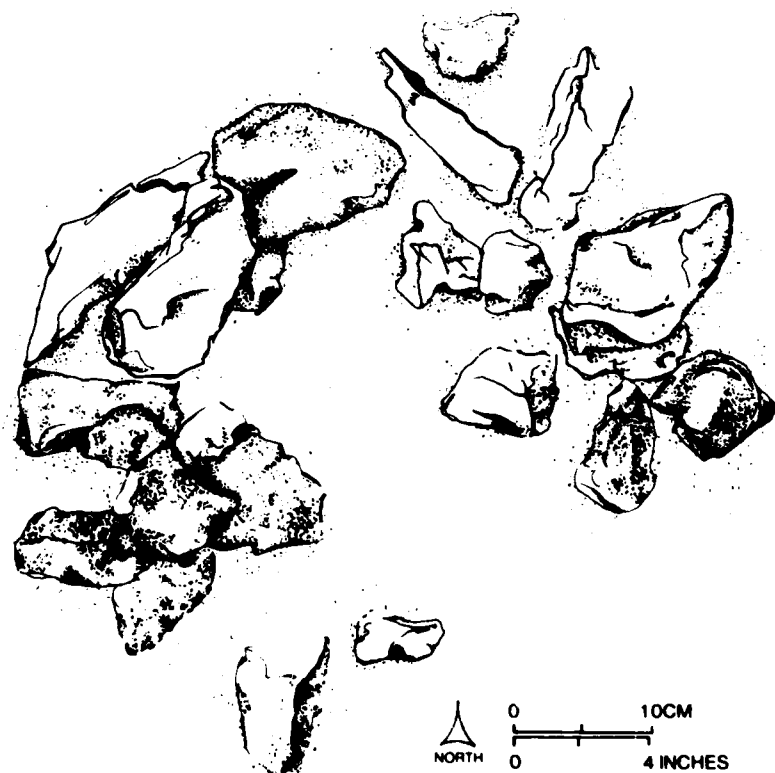
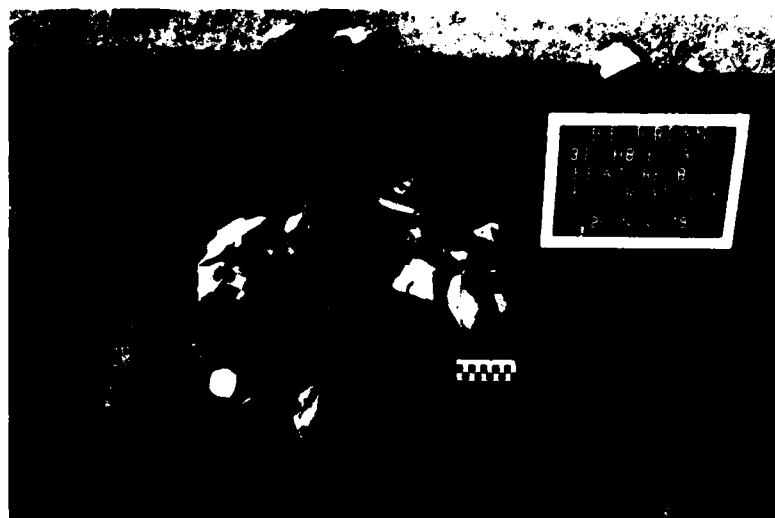
FEATURE CATEGORY II-ROCK CONCENTRATION

A dense cluster of fire-cracked rock and debitage
containing a Kirk variant hafted biface.

PROVENIENCE: Feature 34, 31CH29, Block A, EU2b, Level 20.

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.4
FEATURE CATEGORY II-
ROCK CONCENTRATION



FEATURE CATEGORY II-ROCK CONCENTRATION

Densely clustered fire-cracked rock (>15kg.).

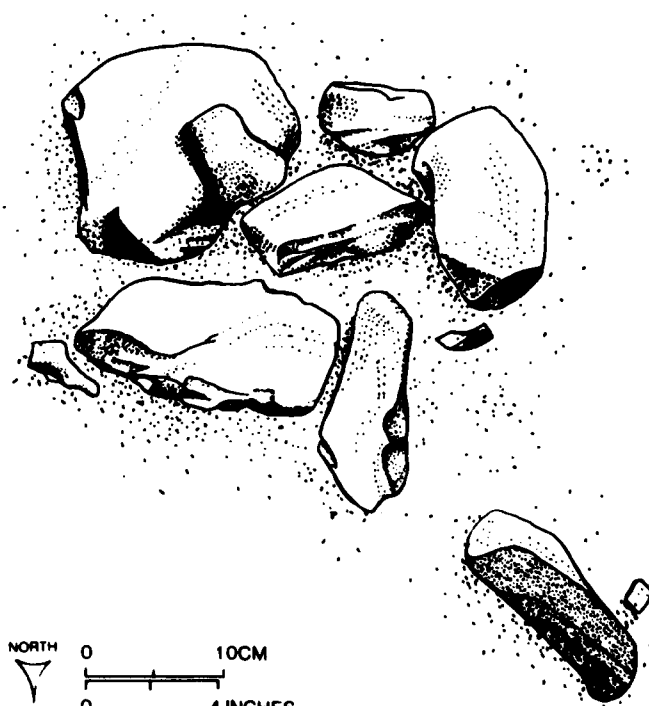
Associated with Morrow Mountain II hafted bifaces.

PROVENIENCE: Feature 8, 31CH8, Block C, EU9b, Level 10.

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FIGURE 7.5
FEATURE CATEGORY II-
ROCK CONCENTRATION

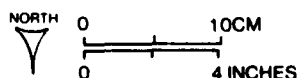


FEATURE CATEGORY II-ROCK CONCENTRATION

Fire-cracked and unaltered rock associated with probable Early Archaic tool forms. Total weight: >5.4kg.
 PROVENIENCE: Feature 36, 31CH29, Block A, EU2g, Level 18.

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.6
 FEATURE CATEGORY II-
 ROCK CONCENTRATION



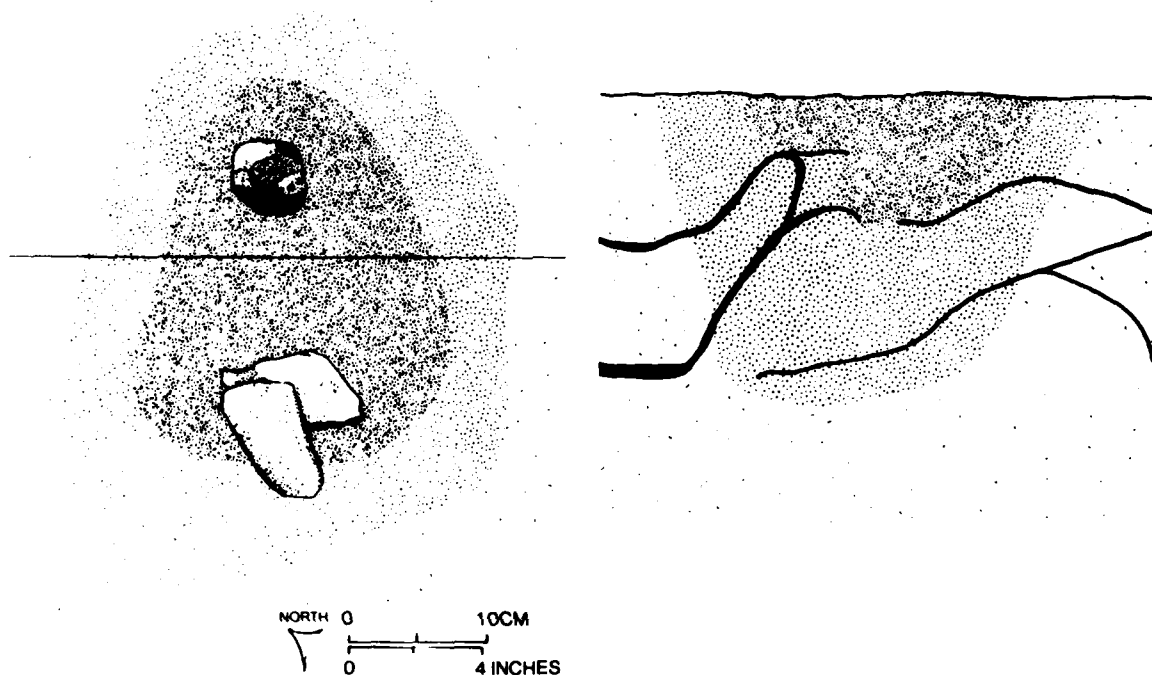
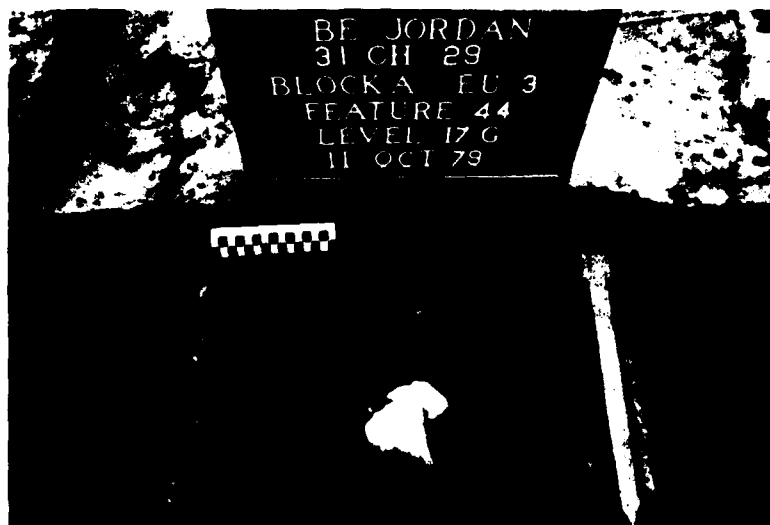
FEATURE CATEGORY II-ROCK CONCENTRATION

Nearly 4 kg. of fire-cracked rock (note fissures) with no associated charcoal stains.

PROVENIENCE: Feature 21, 31CH29, Block A, EU14d, Level 12.

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.7
FEATURE CATEGORY II-
ROCK CONCENTRATION



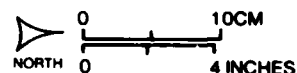
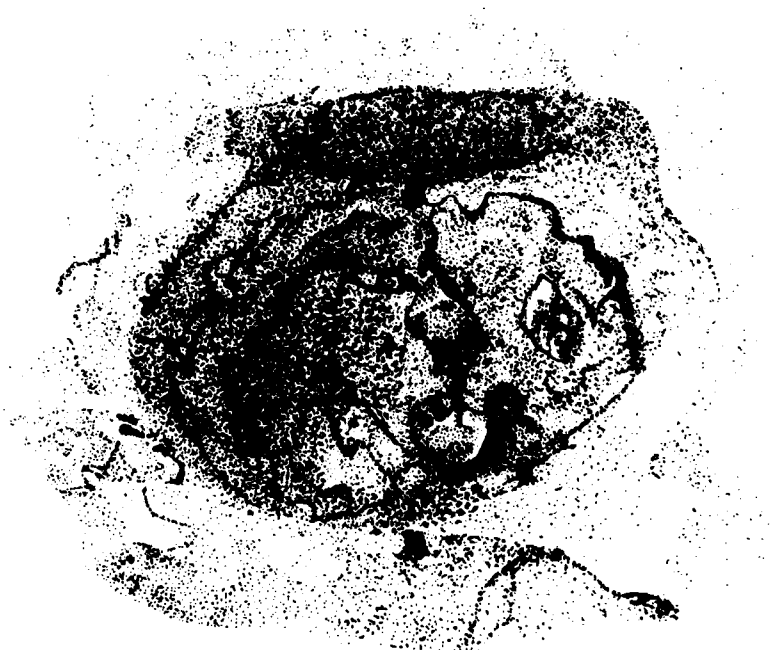
FEATURE CATEGORY III-ROCK/ASH CONCENTRATION

Several fire-cracked rocks, manuports, and flakes associated with grey ashy stain. Possibly intrusive through clay lamellae.
 PROVENIENCE: Feature 44, 31CH29, Block A, EU3g, Level 17.

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.8
 FEATURE CATEGORY III-
 ROCK/ASH CONCENTRATION



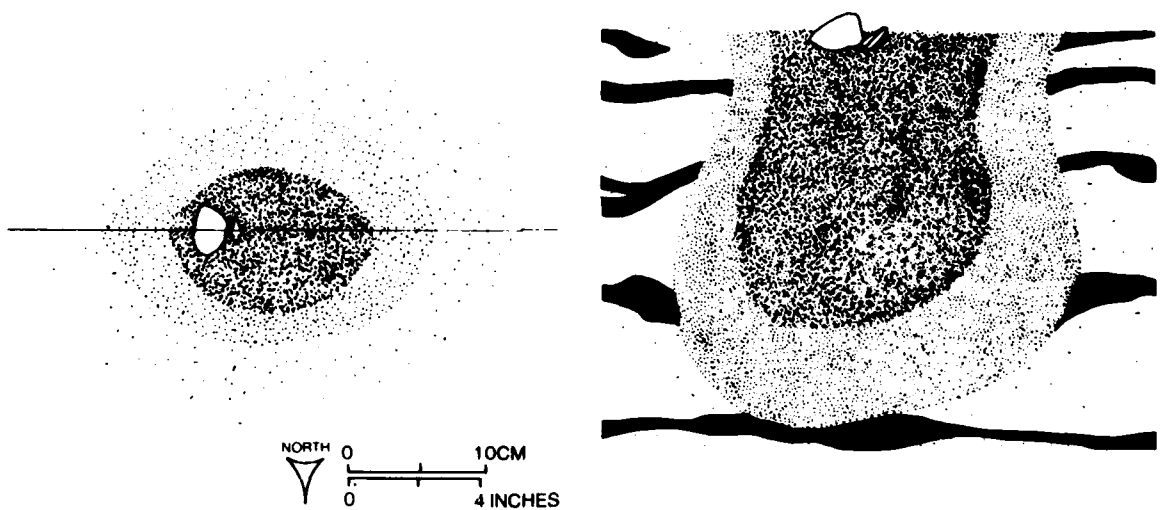
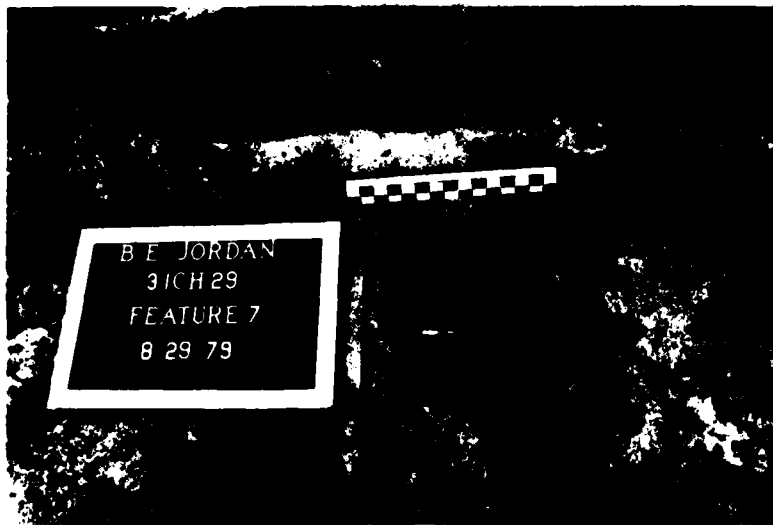
FEATURE CATEGORY IV-BASIN SHAPED PIT

Ashy fill (containing fire-cracked rock and debitage) removed, revealing roughly oval outline. Beta horizons interrupted by aboriginal excavation of fire pit.

PROVENIENCE: Feature 60, 31CH29, Block A, EU9b, Level N3.

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.9
FEATURE CATEGORY IV-
BASIN SHAPED PIT



FEATURE CATEGORY V-GLOBULAR PIT

Exposed during mechanical excavations. Pit interrupted beta horizons and contained ashy, grey matrix capped with a thermally-altered core and a Kirk variant hafted biface.

PROVENIENCE: Feature 8, 31CH29, Block A, EU2g, Level 17

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.10
FEATURE CATEGORY V-
GLOBULAR PIT

VII. Caches	Length	Width	Thickness
N=3	n=3 range=38cm-55cm $\bar{x} = 44.33$	n=3 range=14cm-27cm $\bar{x} = 18.67$	n=2 range=10cm-26cm $\bar{x} = 18.00$

Features 22, 52 and 61 apparently represent individual caches of quarry blanks or unfinished tools which were hidden and never recovered (Figure 7.11). Feature 22, in EU12a, extended from approximately 62cm to 88cm below datum. The top of the cache is associated with stratum 5/4 which is a contact occupation floor containing Kirk II, LeCroy and Morrow Mountain artifacts. Thus, the exact cultural-historical association of the feature is difficult to determine; however, the diagnostic material closest to the cache is attributable to the Morrow Mountain phase.

A large subtriangular pitted anvilstone (250mm x 200mm) overlaid the cache. Below this were a number of marginally retouched flakes and large bifacial core (210mm x 100mm). Beneath those was a globular mass (300mm x 200mm x 150mm) consisting of 140 flake blanks indicative of bifacial core reduction. The cache was placed in what was possibly an artificial pit. The blanks were surrounded by a clayey matrix similar to the clay lamellae and probably the result of retarded illuviation around the blank mass, capturing finer clay particles which normally would settle in the beta horizons in an undisturbed context.

The contents of the cache consisted of one anvilstone, one large biface core, 19 bifaces, 16 utilized flake blanks and 116 unaltered flake blanks. The biface core and all but three of the bifaces, and all but one of the flake blanks, were made of a green latite felsite (Raw Material C). The other three bifaces were made from a latite porphyry (Raw Material A) and the other flake blank was composed of an andesitic felsite (Raw Material B). The cache provides a unique insight into the major flake production strategy, biface core reduction, of the Haw River assemblage. Recovered flake blanks characteristically exhibit one bifacially retouched edge which represents the platform of a bifacial core rather than subsequent edge modification of the flake blank. Platforms are predominantly oriented perpendicular to the long axis of the blank; flake dimensions for mean length, width and thickness are 61.94mm, 39.46mm, and 9.45mm, respectively. Dimensions of Feature 22 bifaces are somewhat larger with means of 78.11mm (length), 44.84mm (width), and 9.45mm (thickness). Apparently the bifacial core reduction strategy provided a method of producing blade-like flakes which could in turn be used as tool blanks or simply as instant tools. In the latter case, most of the blanks would have a ready made biface edge which would provide an appropriate cutting edge with no need for post-flake-manufacture alteration. Approximately 23 percent of the cache assemblage has either evidence of use or post-manufacture bifacial retouch indicating that a significant number of cache items were used prior to their final gathering and caching.

Feature 52, in EU2h Level 30-31, is associated with stratum 15 or the Palmer I occupation floor. The cache is a tightly clustered group of lithic tools consisting of six bifaces, four large edge-damaged flakes and two discoidal quartz flakes exhibiting unifacial edge damage (Figure 7.11). Five of the bifaces and all four of the large edge-damaged flakes were made

from a latite porphyry (Raw Material E). These likely were derived from the same block of raw material. The other biface was derived from a green latite felsite (Raw Material C). All of the items in cache exhibited signs of use. A complete description of the contents of the cache is provided in the lithic artifact descriptions for lamella 15.

Feature 61 consisted of several large tools fabricated of a homogeneous crystalline quartz. The three tools which constitute the feature include a uniface and two bifacially-worked implements. All may represent heavy-duty woodworking tools associated with an Early Archaic Kirk or Dalton substage.

VIII. Ceramic Sherd

Concentrations	Length	Width	Thickness
N=3	n=3 range=54cm-97cm $\bar{x} = 82.0$	n=3 range=32cm-75cm $\bar{x} = 51.37$	n=2 range=10cm-20cm $\bar{x} = 15.00$

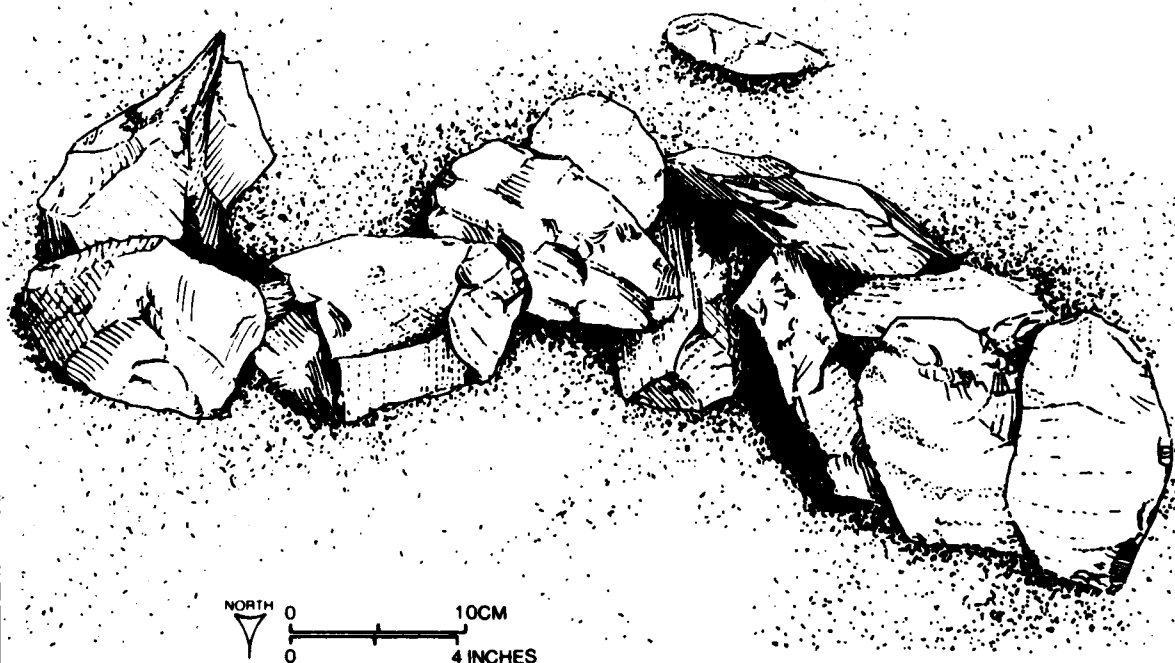
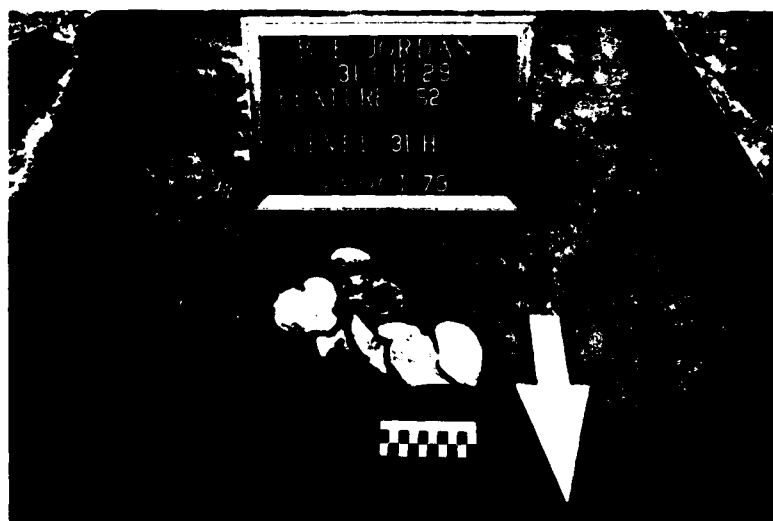
Features 5, 7, and 12 were dense clusters of potsherds apparently representing locations at which vessels were broken and/or discarded. Feature 5 (Figure 7.12) included the remains of two broken vessels, one fabric impressed, the other cord-marked. One small quartz side-notched point was directly associated with the feature in Level 5. A radio-carbon date of 2190 ± 95 BP (Beta-1357) was obtained on a fragment of burned wood found in the same pit as the vessels and the point.

Feature 7 (Figure 7.13) included a number of thick sand and feldspar tempered sherds. The widely-spaced cord markings applied to the vessel exterior were moderately obscured, either by intentional smoothing during manufacture or by post-depositional erosive forces. No obvious displacements due to water action were noticed, however, so the latter interpretation remains conjectural.

The final example of this category, Feature 12, included several thin sherds exhibiting a fine sandy paste and a finger-pinched rim form (Figure 7.13). Several of the sherds articulate to form a portion of a shallow bowl or similar open vessel. Unfortunately, some of the sherds in the feature were not recovered due to frozen ground conditions at the end of the field season.

IX. Miscellaneous

A total of seven features were assigned to this final category, since they could not with any certainty be assigned to the other formal categories. All appeared to be of cultural, rather than natural, origin however. A brief description of each follows:



FEATURE CATEGORY VII-CACHE

A cluster of twelve unifacial and bifacial tools resembling cores and preforms. Early Kirk associations.

(Note: Three items removed prior to photograph.)

PROVENIENCE: Feature 52, 31CH29, Block A, EU2g, Level 28.


DATA RECOVERY AT SITES 31CH29 & 31CH8
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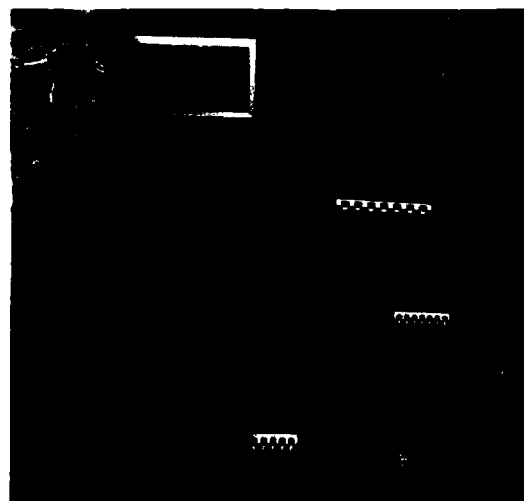
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FIGURE 7.11
FEATURE CATEGORY VII-
CACHE



DATA RECOVERY AT SITES 31CH29 & 31CH8
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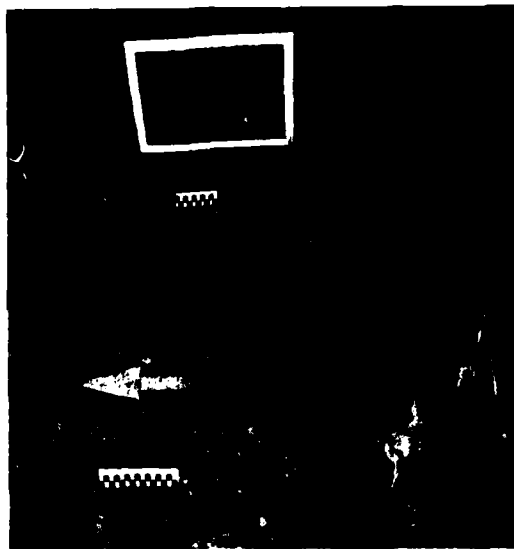
**FEATURE CATEGORY VIII-
CERAMIC SHERD
CONCENTRATION**

Probable garbage pit containing major portions of two vessels (one cord-marked, one fabric-impressed), a side-notched hafted biface, and charcoal dated at AD 2190 \pm 95 (Beta 1357).

PROVENIENCE: Feature 5, 31CH8, Block C, EU7a, Level 4.

**FIGURE 7.12
FEATURE CATEGORY VIII-
CERAMIC SHERD
CONCENTRATION**

2



FEATURE CATEGORY VIII-CERAMIC SHERD CONCENTRATION

A surface scatter of weathered, cord-marked sherds;
no association stain.

PROVENIENCE: Feature 7, 31CH8, Block C, EU6h, Level 4.

DATA RECOVERY AT SITES 31CH29 & 31CH8
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FIGURE 7.13
FEATURE CATEGORY VIII-
CERAMIC SHERD CONCENTRATION

31Ch29

- 1 — A very faint ash stain measuring 18cm x 18 cm, found in a subplow zone context in Test Unit 2, 31Ch29. No associated cultural materials.
- 4 — A faint stain containing a single cord-marked potsherd. Recovered during mechanical stripping of Block A, the feature could not be adequately defined as to function or point of origin.
- 19 — A faint charcoal or ash stain was recorded as Feature 19; further details are lacking in field records and photographs. Apparently, no cultural materials were associated.
- 32 — Feature number 32 was assigned to a large (approx. 5 kg) rock. No obvious alterations were observed in the field but this "manuport" may have functioned as an anvil or some other type of site furniture.
- 42 — Ambiguous field recording prevents definite classification of this feature. It appears in photographs as a large (2500 cm²) grey ashy stain, although the form is rather amorphous. A few specimens of debitage and an irregular biface were associated, but no cultural-historical or functional identifications can be offered.

31Ch8

- 4 — Another victim of poor field recording techniques. This feature appears to have been a typical ashy stain. Its depth relative to the ground surface at 31Ch8 (15-30cm) may have contributed to blurring and non-recognition of any outlines.
- 11 — An indistinct greyish-brown stain, this "feature" contained no cultural materials or visible organic remains. Of the seven examples of this category, Feature 11 most nearly resembled a natural disturbance. Depth below surface was 25-30cm.

TABLE 7.1
FEATURE DATA - 31Ch29 and 31Ch8
Category I - Ash Lenses

Feature No.	Site	Block	Provenience EU/TU	Square	Level
11	29	A	16	f	12
14	29	A	4	f+i	17
25	29	A	12	d	15
26	29	A	12	e+i	15
29	29	A	14	a+d	16
30	29	A	13	a	28
37	29	A	4	g	20
43	29	A	14	i	22
50	29	A	7	a	20
51	29	A	5	h+i	22
56	29	A	11	b	N3
58	29	A	10	b	N2
70	29	A	9	h	N10
1	8		1		12
2	8		2		17
10	8	C	7	g	7
13	8	C	9	f	6

FEATURE DATA - 31Ch29 and 31Ch8

Category II - Rock Concentrations

Feature No.	Site	Block	Provenience EU/TU	Square	Level
5	29		5		5
9	29	A	4	c	14
10	29	A	12	d+a	11
13	29	A	4	i	17
15	29	A	4	d+a	17
16	29	A	4	b+a	16
17	29	A	4	e+i	17
20	29	A	13	f+e	15
21	29	A	14	d	12
23	29	A	6	i	15
27	29	A	5	f	11
28	29	A	12	f	15
33	29	A	5	f	14
34	29	A	2	b	17
35	29	A	2	c	20
36	29	A	2	g	18
38	29	A	14	d+a	21
40	29	A	5	f+c	18
46	29	A	7	e	15
47	29	A	7	c	16

Category II — Rock Concentrations (Cont'd.)

Feature No.	Site	Block	Provenience EU/TU	Square	Level
49	29	A	7	g	16
53	29	A	5	h-i	27
54	29	A	10	c	N5
55	29	A	10	g	N2
57	29	A	11	d	N3
58	29	A	10	e	N3
62	29	A	11	b	N7
64	29	A	10	e+f	24
64	29	A	9	g	N6
65	29	A	9	b+c	N13
8	8	C	9	b+c	10

FEATURE DATA -- 31Ch29 and 31Ch8

Category III -- Rock Clusters

Feature No.	Site	Block	Provenience EU/TU	Square	Level
6	29		3		20
7	29		3		24
31	29	A	4	a	21
41	29	A	3	f	18
45	29	A	7	h+e	15
48	29	A	7	e	16
9	8	C	2	f	6

FEATURE DATA -- 31Ch29 and 31Ch8

Category IV -- Basin-Shaped Pits

Feature No.	Site	Block	Provenience EU/TU	Square	Level
12	29	A	13	c	9
44	29	A	3	g	17
60	29	A	9	b+c	N3
69	29	A	9	e	N12
3	8	C	9	e	2
14	8	B	3	f	13

FEATURE DATA -- 31Ch29 and 31Ch8

Category V -- Globular Pits

Feature No.	Category V -- Globular Pits			
	Site	Block	Provenience EU/TU	Square Level
8	29	A	2	9 17

FEATURE DATA -- 31Ch29 and 31Ch8

Category VI -- Fired Areas

Feature No.	Site	Block	Provenience EU/TU	Square	Level
39	29	A	6	f	28
67	29	A	10	a	N21

FEATURE DATA - 31Ch29 and 31Ch8

Category VII - Caches

Feature No.	Site	Block	Provenience EU/TU	Square	Level
22	29	A	12	a	14
52	29	A	2	h	31
61	29	A	4	b+a	35

FEATURE DATA - 31Ch29 and 31Ch8
Category VIII - Ceramic Sherd Concentrations

Feature No.	Site	Block	Provenience EU/TU	Square	Level
5	8	C	7	a	5
7	8	C	6	h	4
12	8	C	5	h	4

FEATURE DATA - 31Ch29 and 31Ch8

Category IX - Miscellaneous

Feature No.	Site	Block	Provenience EU/TU	Square	Level
1	29		2		10
4	29	A	10		
19	29	A	8	c	19
32	29	A	4	d	25
42	29	A	15	b	16
4	8	C	7	a	5
11	8	C	7	f	5

CHAPTER 8 TECHNOLOGICAL ASPECTS OF THE ASSEMBLAGES

Several aspects of lithic technology which were perceived as important to our analyses and descriptions of the Haw River assemblages will be introduced in this brief chapter. Detailed discussions of individual artifacts and grouped tool assemblages, as well as comparisons with artifacts from other archeological sites are provided in Chapter 9. Rather than involve the reader in digressive accounts of particular tool usage patterns or ethnoarcheological studies of modern stone tool usage in that report section, we have chosen to introduce certain of those ideas and concepts at this point. Perhaps by familiarizing readers with technical discussions of things like edge wear patterns or core reduction strategies at this juncture, we can avert some confusion in the more straightforward but lengthy presentation of artifact data from 31Ch29 and 31Ch8.

What follows then are brief topical discussions of some particular characteristics of prehistoric or modern stone tool assemblages drawing from several sources to help elucidate comparable patterns found at the Haw River sites.

WEAR PATTERNS ON BIFACIAL IMPLEMENTS

Keeley (1980:22-23) has established that bone, wood and meat can all produce micro-wear polishes on the edges of stone tools. Each of these polishes possesses distinctive characteristics. Wood polish (Keeley 1980:35) is highly reflective (glossy) and smooth. It forms first on the prominences of a tool edge and creates a rounded or domed surface. As tool use continues in a woodworking activity the domed areas begin to join, further altering the original sharpness and irregularity of the stone. Bone polish (Keeley 1980:42-43) requires a much longer period of time to form and consequently is very rarely extensively developed on a stone tool. It exhibits a bright greasy luster, but the surface is pitted rather than smooth like wood polish. Also unlike wood polish, bone polish is confined to prominences of the microtopography and seldom spreads to the entire surface. The polish can be quite intense however. Meat polish (1980: 53-54) as described by Keeley relates only to cutting functions. The brightness of this polish is variable, but tends to be dull and does not stand out extremely from unpolished areas of the stone. Like bone polish, meat polish exhibits a greasy luster. Soft meat cutting produces a gently rounded edge over most of the microtopography.

It is possible, of course, that the extensive polish recognized on some Haw River tools is a result of natural perturbations, since there are many factors present at 31Ch29 and 31Ch8 which would provide conditions amenable to such "pseudo" wear. Keeley (1980: 28-35) discusses the effects of three processes which are pertinent to conditions at the sites:

1) patination; 2) abrasion by water-borne sediment; and 3) solifluction or cryoturbation. Each of these will be examined in relation to their potential for producing the polish observed which is characterized by extensive rounding and polishing of flake scars and variable polish intensity on raised areas of ventral surfaces.

Patination (Keeley 1980:29) erosion can be of two major forms, white patination and patination polish. White patination is brought about by the chemical erosion of stone artifacts by agents such as alkaline environments, ultra-violet radiation (sunlight) and acids released by plants. This results in a granular, porous stone surface which can exhibit distortion of the original features of an artifact with continued decomposition. Occasionally a "polish" can occur with white patination along the edges and ridges of stone artifacts. The origins of this phenomenon are not well understood. Unlike polish resulting from use which is generally accompanied by striations, patination polish is undifferentiated much like a glaze or a glass polish. The polish is restricted to the white patinated areas of the protruding edges and ridges. Therefore Keeley (1980:29) suggests that the rule for identifying patination polish on stone artifacts is that it must coexist with white patination on all angular surfaces.

Based on this criterion it would not appear that much of the polish on artifacts from the Haw River sites can be attributed to patination. In most cases, patination is present only in areas where cortex was not removed from the implements, and does not occur in areas of exposed raw material. In fact, on several specimens the original cortex has been worn away exposing polished unpatinated surfaces. Secondly, polish is not evenly distributed to all ridges, protrusions and edges. Freshly chipped areas along the edges are devoid of polish altogether, and the remnant prominences which do exhibit polish are characterized by a semi-matte smoothing indicating the presence of striae along with polish. In the invasive regions of the implements, the polish is not restricted to prominences, but occasionally occurs in the hollows of flake scars. Also, polish is not evenly distributed across the invasive regions as some areas still exhibit fresh surfaces. Based on these forms of evidence, it would seem unlikely that the polish on many implements would result from patination processes.

Solifluction is another possible source of natural modification of artifacts. Keeley (1980:31-34) indicates that the two common forms of alteration in this instance are scratches and edge fracture damage, caused by solifluction, which do not apply to our artifacts. However, another little understood form of wear thought to be connected with soil movement is referred to as "abrasion tracks." Abrasion of this sort resembles "hammerstone scratching" and is located on the tops of ridge scars and other prominences. Abrasion tracks are thought to be brought about by rubbing against pebbles or other lithic objects such as artifacts. Under soil movement pressures it is not hard to imagine that artifacts from a cache piled one on top of another might rub together producing abrasion on ridges and other prominences. This, however, would not explain glossy polish on the hollows of the flake scars nor the polished, semi-matte character of the ridge scars. A dull

polish or abrasion can occur on ridges from soil movement, though, and is commonly associated with pot lids or percussion craters. Keeley (1980:34) states: "The main clue to its being natural is the fact that it may sometimes cover all of the ridges on a hand ax, let us say, something no microwear polish could do." Global polish was observed on the invasive portions of some bifaces (see Feature 52) from 31Ch29, however. This "polish" is restricted to ridges and other prominences of artifacts and not the hollows of the flake scars. Keeley (1980:34) is at a loss to explain the origins of such modifications, stating:

It may be water-abrasion, but since the 'polish' is often restricted to just the ridges and does not affect the hollows of the flake scars in between, it is more probably the result of soil movement. Again, its cause is irrelevant, so long as the microwear analyst does not confuse it with true microwear.

The subject of water-borne abrasion points to one natural process which could have affected the hollows of the flake scars on bifaces to a significant level. Keeley (1980:30) comments that the effects of water abrasion are easily identified in extreme cases, but in other cases, where implements were exposed to this process for only a short period of time, the traces of modification are more subtle and require microscopic examination to distinguish them from true wear polish. One method for recognizing the early stages of water-abrasion is to search for stress cracks which take on a braided appearance. However, Keeley points out that such cracks are also a property of freshly percussed flint and that use can create friction stresses that are capable of producing such characteristics as well.

Many specimens from early occupation levels of 31Ch29 exhibit spots of edge rounding or polishing along their perimeters, predominately unifacial nibble and step fractures along the edge, and rounding or polishing of the flake scar ridges across both faces. The extensive rounding of ridge scars across both faces of such items presently is not well understood. It is conceivable that it could be a consequence of patination. However, the rounding noted on the bifaces often takes on an almost lustrous sheen, as opposed to a non-reflective surface indicative of mineral decomposition. Additionally, the luster on the ridge scars appears macroscopically identical to the luster and rounding which occurs along the edges, which is undoubtedly wear resulting from use. If the luster on the ridge scars is actually a consequence of use, then we must consider what kinds of uses would cause such a pervasive penetration of the faces of these tools. It has been suggested that this kind of wear pattern might indicate axing activities associated with heavy-duty butchering of large mammals (e.g., moose, caribou, deer, etc.). Penetrating an animal carcass in an axing motion (see Semenov 1964:126) would provide one means whereby ridge polishing and rounding might occur, since the carcass would split and yield under force allowing deep penetration of the ax blade.

If bifaces were hafted and used as butchering tools, then a very interesting question arises concerning the technological development of hafted chopping tools (axes and adzes). Although it is commonly held that these tools arose in conjunction with the need to undertake heavy-duty woodworking activities, it is quite possible that their original function was actually something totally unrelated. Hafted axes or adzes may have existed solely or predominately as butchering tools for a long period of time prior to the Neolithic. Semenov (1964:122) has commented on the antiquity of the hafted chopping tool, noting its existence (for woodworking purposes) well into the Paleolithic.

Besides woodworking, the wear pattern described might apply to butchering activities. Binford and Bertram (1977) have discussed at some length the use of axes by Navajo in disarticulating large game animals. Contact with bone, sinew, oil and other biological lubricants should provide the necessary conditions discussed by Kamminga (1979:149-151) to produce polished or smoothed edges as well. This sheds an interesting light on discussion of the use of the Dalton adze by Morse and Goodyear (1973) which could possibly represent a butchering tool used to sever bone articulations rather than a woodworking tool. Although its morphology is consistent with Semenov's (1964:126) requirements for a wood working adze, one must ask whether this evidence is enough to assume that the Dalton adze was a woodworking tool. This might provide one explanation for Morse's and Goodyear's (1973: 319) puzzlement concerning the seeming inappropriateness of the Dalton adze within the Dalton tool inventory:

The presence of the adze in a Dalton context is intriguing since it occurs in a tool inventory largely oriented towards the butchering and processing of game. Furthermore, the adze in the Dalton tool kit seems to be a frequent and expendable tool.

Assuming that the ubiquitous adze was a heavy woodworking tool leads the authors (Morse and Goodyear 1973:320) to expect "their use on a scale which might involve the building of relatively permanent housing structures or the construction of dugouts." This is suggested, the authors admit, in spite of the lack of demonstrable evidence for semi-permanent or permanent structures in the Dalton archeological record. In fact, evidence of this sort does not seem to appear anywhere in the eastern United States until the Late Archaic and Woodland periods (see Griffin 1967 and Willey 1966). In any event, the uses of tools such as the Dalton adze and the bifaces discussed here might be resolved through use-wear experimentation designed to detect differences between heavy duty woodworking and butchering wear patterns.

Certainly the specialized hunting and butchering assemblage of the Dalton horizon, as well as that of Old World upper paleolithic assemblages, might argue against intensive tree-felling activities in response to forested environments at those early times. Semenov

holds that the ax was primarily a woodworking tool from its inception. However, other evidence led him to concede that this was not the only use for which the ax was enlisted (1964:125):

All the same, study of the bones and mammoth tusks of such sites as Kostenki I, Gagarino, Suponevo, Eliseevich, Malta and many others (where numerous thin and thick tusks, shoulder blades, ribs, long bones and antlers bore signs of hewing or chopping) leads one to think that wood was not the only material worked with an axe. . .

Examination of the different notches or cuts on the bones of large animals lends further weight to the contention that the axe existed in upper paleolithic times. Some of the cuts on mammoth long bones from Kostenki I are noticeably bow-shaped (see Figure 60.3). They are all curved one way, which indicates that the edge of the axe probably also was curved. Evidently this form was typical of the axe's working edge in upper paleolithic times.

Semenov did not speculate on what the bone hewing at Kostenki I might entail, but butchering may be considered a distinct possibility. Klein (1973:89-110) has reported many incidences of large mammoth bone circles and ovals associated with the Middle and Upper Paleolithic of the Ukraine which are interpreted as functioning as skin anchors for dwellings. But such use would appear to be *post facto* to the initial procurement of the bones and it is unlikely that the bones were hewn specifically for this purpose. It is also unlikely that such hewing would be an efficient method of marrow extraction since this activity is generally accomplished by splintering and shattering the bone all along the longitudinal axis. Furthermore, bones from the Kostenki I assemblage which exhibit ax cuts (long bones, ribs and scapula) are those which would require the most effort in breaking away from the carcass during butchering (see Frison 1979:260-261). The advantages of using an ax or other kinds of chopping tools in the butchering of an animal the size of a mammoth should be obvious.

It should be pointed out, though, that large game can be completely skinned and dismembered without the use of such heavy duty tools. Binford (1978b:51-54) describes a number of Nunamiut butchering episodes where only a knife was used in conjunction with manual twisting and cracking of bone to butcher caribou. There are other cases, however, where heavier duty tools are used in butchering. Frison (1974 or 1978) has enumerated the use of expediently fashioned bone choppers in bison butchering by early prehistoric Plains Indians. Through butchering experiments he is able to state (Frison 1979:261):

It is possible to butcher the largest bison with simple cutting tools by making the necessary cuts in the hide, removing the hide, and stripping the flesh from the bones. The addition of some simple chopping and breaking tools

speeds up the process. Rather than cutting the muscle loose from large animals at its point of origin or insertion, it is much easier if the origins of the insertions of a number of key muscles on the various bones are chopped loose and left attached to the muscles for hand holds. These muscle origins and insertions are softer than the diaphyses of heavy long bones and can be chopped off or broken off relatively easily.

By experimentation, it was soon discovered that the butchering process becomes more efficient with the addition of a stone chopper or a hammerstone to the chipped tool assemblage, and it is very easy to shift into this butchering pattern. However, further experimentation shows that in some tasks encountered in butchering a bone chopper is superior to a stone chopper, and it is just as easy to shift into a pattern of flake tool-bone-chopper-hammerstone process of butchering.

It is clear that there are a number of different ways to do the same thing. "The proximal humerus may be removed by chopping off the proximal tuberosities or the entire proximal end by use of either stone or bone choppers. Also there are many different ways of treating the pelvis. Ribs may be broken with a stone or bone chopper, hammerstone, or possibly better yet by snapping them off with a quick upward lift. These are all alternatives to accomplish the same end; and the entire list of alternative processes is long." (Frison 1979:261-262).

Butchering practices are highly variable in the ethnographic record as well. As already mentioned, the Nunamiut manage to butcher caribou with nothing more than a knife (Binford 1978:48-60). The use of a steel axe to butcher sheep has also been documented for modern Navajo by Binford and Bertram (1977:93).

The reasons for cross-cultural variation in the details of butchering may relate to cultural differences, but Binford (1978:87-90) argues that the general organizational characteristics of butchering practices are more accurately seen as responses to environmental variability. He points out that the Alawars,¹ Kung and Navajo are very similar in their butchering strategies although their methods of butchering are different. Each of these groups is organized to meet only immediate (day by day) consumption needs. As a consequence, their butchering techniques are highly stylized and unvarying. By contrast, groups such as the Nunamiut and Plains Indians exhibit great variability in the butchering practices they employ. These groups exploit migratory game whose distributions vary seasonally; these distributional changes create need for hunting strategies which can take advantage of storage, as well as strategies designed to meet immediate needs. As a result, they are faced with a diversity of kill situations where the numbers of animals taken can range from one to more than one hundred. Butchering techniques vary in response to the kind of storage (dry, winter) anticipated, and other aspects of logistical organization which can become quite complex in collector strategies such as the Nunamiut or High Plains Indians.

If certain of the bifaces from the Haw River sites actually represent butchering axes, then what does their presence mean? If butchering can be accomplished with only a knife or small cutting tool, is their presence the result of cultural preference or tradition? Frison (1979) may provide a satisfying alternative. Through experiments he determined that the use of "chopping" tools increased the efficiency with which butchering could be accomplished. In other words, it could speed up the process. In communal kill sites, such as those Frison discusses for the High Plains, it is of paramount importance to process meat quickly to prevent spoilage. This is even of greater importance in warmer weather when the rate of decomposition is accelerated.

Thus, axes or other chopping implements may occur in archeological assemblages at locations where multiple kills were anticipated at one time or during the course of a single day, especially during warmer months when speed of processing was at a premium. In the case of the Haw River occupation (see Palmer I assemblage discussions) this might relate to deer drives. Ethnohistorical accounts of deer drives in the eastern United States are abundant (See Swanton 1946, Speck and Shaeffer 1950, Trigger 1969 and Waselkov 1978). Although it has been argued that communal drives required an advanced level of social organization (i.e., Waselkov 1978), it should be noted that Great Basin Shoshone bands (Steward 1955) were able to conduct such activities without benefit of a complex society. The alluvial basin where 31Ch29 is located may have presented reasonable conditions for organized drives. Caching of tools for future needs suggests some special kind of activity. The presence of numerous endscrapers whose probable function was hide scraping, lends further support to the argument.

The hypothesized function of these tools would imply contact with a number of different materials including meat and bone as well as tendons, ligaments and cartilage. It might be logical to expect several kinds of polish in this instance. Keeley (1980:146) interpreted the wear on a cordiform hand ax from Hoxne as a mixture of bone and meat polish, but he neglected to describe the exact configuration of the wear. In the process of butchering, any region of an ax bit would stand a good chance of coming into contact with all of the various materials discussed above and the resultant polish would consist of a blending of lusters. The first polish to form, according to Keeley (1980:53-54), would be a dull, greasy meat polish. Due to the softness of the tissue this polish would form not only on prominences, but also along the rest of the edge. With progressive use, the prominences should develop a bone polish and become increasingly more domed and rounded. This of course fits nicely with the patterns of polish found on the edges of certain cached tools at 31Ch29. Whether or not this pattern indicates that these tools were hafted and used as butchering axes or simply used as a large cutting tool as suggested by Keeley (1980:146) is not yet established. The character of the polish, though, strongly argues for a butchering use.

A realized problem in proposing an axing-butcher use for such tools is that experimental microwear analysis has not been undertaken. It is difficult to generate precise expectations for the wear which heavy butchering with a hafted chipped ax would produce. Keeley (1980:79-82) takes the term "hand ax" literally and assumes that large bifaces were unhafted. His subsequent experiments are thus based only on the possible uses of hand-held tools (i.e., digging, cutting meat, scraping fat from hide and sawing bone joints). Consequently, the basic form of wear visible on a hafted butchering tool is not known. Furthermore, the patterns observed on some of the Haw River bifaces must be held suspect due to the possibility of natural abrasive and polishing processes. Conclusions of a definite nature, of course, could only result from experimentation.

WEAR PATTERNS OF UNIFACIAL IMPLEMENTS

Wear patterns observed on endscrapers from 31Ch29 are consistent with those produced during skin-working (Hayden 1979c). Hayden's endscraper collection from ethnographically-documented Eskimo contexts exhibited both dorsal and ventral face use fractures and abrasive wear. Ventral fractures are most characteristically feathered terminations (Hayden 1979c:218). Dorsal fractures were considered to have "more potential for identifying activities on the basis of fracture types" (Hayden 1979c:218). Crescentic step fracturing and shatter were the most common forms of dorsal fracture. Feathered terminations were the most infrequent (Hayden 1979c:220). Minute crushing along the edge was also rare. Abrasion manifested itself in five basic ways (Hayden 1979c:224):

- (1) pronounced rounding of edge prominences and in most cases, edge arcs, indicating a semi-plastic material being worked;
- (2) abrasive, moderately high reflective, semi-matte smoothing, which does not attain a high polish, on edges and dorsal working face;
- (3) the presence of faint linear depressions and scratch striations along the edge and on the dorsal face that, where observable, tend to converge either toward the center of the dorsal or ventral face (depending on how the implement was used) and are subparallel and occur at approximately 90° orientations to the edge at the center of the working edge;
- (4) dorsal abrasion, which achieves a modal extension of 1-2 mm relatively early in the development of wear, and which may extend 6 mm or more up the dorsal ridges in specific spots;
- (5) the almost complete absence of abrasive wear on the ventral face, except for faintly increased reflectivity immediately adjacent to the edge, and occasional ridge or prominence abrasions.

The endscrapers from Hayden's collection were highly variable in intensity and kinds of wear present along the working edge, for which he cites two reasons. First, since wear intensity increases with use duration, it follows that wear patterns will be individual to each specimen. Second, resharpening episodes will serve to partially obscure wear patterns. This is especially significant in the case of a highly curated tool such as a hafted endscraper. Hayden (1979c:225) cites the 1891 observations of Otis Mason, an Eskimo ethnographer, of how retouch obscures evidence of wear on endscraper bits. Mason noted that the northwest Eskimo of Alaska were perpetually working leather with "scraper blades" (endscrapers). A consequence of this activity was the repeated need to rechip the working edge until it had been worn down to a "mere stub." The result of this reedging was that specimens rarely exhibited "signs of great wear." Commenting on his ethnographic collection Hayden (1979c:225) states: "If these specimens do not represent 'great wear', then the maximum possible wear must be quite astounding. My experiments with obsidian skin scrapers on semidry skins amply support this conclusion."

Following Hayden's wear pattern observations for endscrapers, the Palmer I and II samples from 31Ch29 were subjected to a systematic macroscopic wear examination (see Table 8.1). Forms of wear which are not readily visible without high magnification such as striations and scratches were omitted. Also, Hayden's various fracture types were lumped into a single category for this analysis. The intensity of wear types was ranked for each specimen on a tripartite scale ranging from light (1), to moderate (2), to high (3). Absence of a type is indicated by a zero.

Examination of Table 8.1 will indicate that the two samples exhibit very similar wear patterns. As in Hayden's sample, traces of wear on the ventral surfaces is rare. Minute edge crushing along the dorsal aspect of the bit edge is also rare. In both cases dorsal fractures and abrasion are common. Plate 8 in the next chapter contains several examples of the abrasive wear exhibited on endscraper edges from these samples. There is some suggestion that polish is less abundant on the Palmer II sample, but it is difficult to substantiate.

A consideration of wear type distributions suggests that dorsal fracturing is inversely related to abrasion. In cases where the intensity of abrasion is high, occurrence of dorsal fracturing is either low or moderate. This would suggest that both resharpening and edge modification due to use tend to obscure the evidence for abrasion (cf. Hayden 1979c:225).

Nevertheless, the ubiquitous evidence for abrasive wear on these specimens suggests that they were used to soften dried skins. When Hayden (1979:225) employed an experimental endscraper to scrape the flesh and fat off a fresh deer skin very little abrasion occurred along the working edge. Minute step fracturing was prevalent along the dorsal face, however. By contrast, the scraping of dry or semi-dry brine-treated skins very quickly produced pronounced abrasion along the edge. Hayden (1979c:225) describes the formation

Table 8.1
Wear patterns on Palmer I and II endscrapers, 31Ch29

Palmer I Endscrapers

	Polish	Abraded Prominences	Abraded Arcs	Extension of Abrasion on Ventral Surfaces	Abraded Prominences Dorsal Surface	Ventral Fractures	Dorsal Fractures	Edge Crushing
14-1-29-1	0	3	3	0	1	2	3	3
14-4-29-2	2	3	3	0	1	0	1	0
4-9-29-1	1	1	1	0	1	0	2	0
8-8-29-2	1	1	1	0	1	0	3	1
13-5-29-3	1	1	1	0	1	0	3	0
15-5-29-2	1	2	1	0	1	0	3	0
15-5-29-3				(NOT OBSERVABLE)				
14-2-29-3	1	2	2	0	1	1	1	3
8-3-29-1	1	2	1	1	1	0	3	0
8-4-28-2	1	1	1	0	1	0	0	0
16-4-28-5	1	3	2	0	1	0	2	0
16-5-28-7	1	1	1	0	0	0	2	0
12-2-27-1	0	1	1	0	0	1	3	3
12-2-27-2	3	3	2	0	1	0	2	2

Palmer II Endscrapers

11-5-28-2	0	1	0	0	1	0	3	0
1-7-28-1	1	2	2	0	1	0	2	1
13-3-28-2	0	1	1	0	1	0	3	0
10-9-28-1								
1-8-27-2	1	1	1	0	1	1	3	2
2-1-27-1	0	1	1	0	1	0	3	2
14-1-27-2								
7-3-26-1	2	3	3	0	2	0	2	0
13-6-26-1	1	1	1	0	1	0	1	0
15-9-28-7	1	1	1	0	1	0	1	1

of wear abrasion in the following manner: "I was not a little surprised to find after working an *almost* dry skin for only about 10 minutes that my obsidian edge looked like someone had placed it on a grinding wheel and blunted it, whereas previously hours of defleshing the fresh skin resulted in no immediately perceptible abrasion to the scraper edge."

Since working of fresh skins can produce the same fracture patterns as dry skin working, the first use cannot be totally dismissed as function of Palmer I and II endscrapers. But the close correspondence of sample wear patterns with those of Hayden's study suggests that this tool form was used only for hide processing. Commenting on the specimens from his collection Hayden (1979c:226) states:

Also of interest is the total lack of evidence of other types of use wear on these scrapers. There is absolutely no indication that any of these specimens was used for anything but skin working.

Thus, just as the wear patterns on the Eskimo endscrapers indicate a specialized use, so do many of those on artifacts from our sample.

The use of ethnoarcheological data to interpret prehistoric stone tool functions thereby allows us to accurately characterize certain activities of the prehistoric inhabitants of the Haw River sites.

CHEMICAL WEATHERING OF LITHIC ARTIFACTS

Recent technical studies have suggested that macroscopically observable differences in wear characteristics may relate to the different molecular structures of lithic raw materials than to differences in use. Kamminga (1979:149), relating D. C. Cornish's research concerning optical polish on glass, suggests that polish on stone tools can result from the chemical interaction between silica contained in a stone, a polishing agent, and water. He describes the process in the following manner (Kamminga 1979:149):

...the sequence of events begins when the surface of the glass is exposed to water molecules. A reaction takes place as hydrogen ions from the water molecules migrate into the surface replacing cations and therefore creating a hydrolyzed surface layer (i.e., silica gel). Hydrolysis can occur very easily, in fact as soon as a fresh fracture surface is exposed to a humid atmosphere, but the process is accelerated by the presence of liquid water. The thickness of this hydrolyzed layer can vary considerably, depending on the degree of exposure and the quantity of foreign ions in the silica body. In pure silica the depth of the layer is normally less than 100 Å.

The polish agent, which is always an oxide, under a small load, is pressed onto the glass surface and complex but temporary bridging bonds are formed

between atoms in the polishing agent and those in the contact area of the glass surface. The oxygen-bridging bonds between silica atoms have been weakened by hydrolysis and consequently the energy required to break these bonds is lowered. The Si-O-Si bonds in the silica matrix of the glass are then chemically ruptured. Hydrated silica molecules thus freed, at first remain attached to the oxide in the polishing agent through hydrogen bonding, and as the adsorption is readily reversible these silica units plucked from the glass are expelled into surrounding water.

Kamminga (1979:149-151) argues that stone tools should undergo analogous interactions. First, phytoliths or opaline silica which are present in plants can serve as an adequate polishing agent. Second, plants also contain water which is essential in the chemical interactions described above. Third, the structure of stone, like glass, is composed of silica bonds and consequently should provide similar conditions for the formation of polish.

Based on these observations it is possible that the degree of polish occurring on stone tools is related to variability in the nature of chemical bonding from one stone material to the next. In cases where bonding is stronger (where the raw material is harder), polish may take longer to form. Thus, differences in stone tool wear patterns exhibited by, for example, the chert Dalton adzes of northeast Arkansas and the metavolcanic adzes from the Haw River sites discussed here, might relate to differences in the chemical structure of the raw material rather than to differences in use.

Another major possibility to explain these differences relates to variability in the material being worked. Hayden (1979a:126-127) observed that adzes used by Australian Aborigines varied in use-wear characteristics depending upon whether they were used on hard or soft woods. Adzing of soft woods resulted in extreme gloss and striation, while wear on adzes used on hardwoods was slight or macroscopically unobservable. Of the 53 adzes Hayden saw being used on hardwoods only eight percent exhibited gloss back from their edges and in only one case was the gloss more than very slight. Depth of penetration into the objective material is undoubtedly the conditioning factor in such instances (Odell and Odell-Vereecken 1980:101).

TOOL CURATION PATTERNS AMONG MODERN HUNTER-GATHERERS

Among Australian Aborigine groups, adzes were the only hafted tools observed by Brian Hayden (1979a) on which any significant amount of curatorial energy was expended. Unlike the "true adze," described by Semenov (1964:126-129) and discussed by Morse and Goodyear (1973) in some detail, which is characterized by a transverse working edge, most Australian adzes have their bits oriented laterally or parallel to the long axis of the flake. The adze has a great antiquity in the Western Desert, extending back at least into the early

Holocene (see Gould 1980). A scan of archeological examples of these tools (see Gould 1971:155-156) will indicate a distinct morphological resemblance to so-called side and oval scrapers of New World assemblages.

Although the curatorial effort expended on adzes tended to make them the most readily identifiable tool class in ethnographic and archeological assemblages, Hayden (1979a:12) describes several forms they can take. Of 51 whole adzes he observed in use at Papunya Hayden would have classified only 36 as adzes or scrapers if they had occurred as part of an archeological assemblage. As many as 20 of these might have been classified as scrapers. The remaining functional adzes would have been identified by Hayden as utilized flakes (14), notches (2) backed pieces (2), or truncations (1). This variability in form can be attributed to two basic sources. First, variation in size and general edge shape of adzes will depend on the flakes available for selection. A good deal of variation can occur in a pile of flaking debris. Second, the amount of retouch applied to adze edges will relate to the original suitability of the edge, the duration of the adzing task, and the availability of other lithic materials. Hayden (1979) indicated that at the time of first hafting only 18 of the 56 adzes he observed in use were actually retouched to modify the bit. In addition, approximately 20 to 30 percent of the adzes retained an unretouched edge after discard.

Hand-held shaving tools (Hayden 1979:13) were characteristically unretouched. Generally selection was made for suitable edges from unaltered flakes. Only about 12 percent of Hayden's sample would normally have been retouched. The most surprising aspect of this tool category for Hayden was the extreme variability in edge shape within this functional category. He stated (1979:13):

Caution is advisable here because of the relatively small sample, but I could discern no difference in use context for pieces resharpened by scraper, notch, or denticulate edge modification. All these modes seemed to be functionally interchangeable, although it is always possible that one mode might be used in situations where others would not be.

He adds that flakes with apparent burin morphology were also used for shaving wood, the 90° burin angle serving as a shaving plane (Hayden 1979:13 and 157).

Retouch occurs even less frequently in the saw category. One distinguishing characteristic of saws was the selection for naturally abrupt (broken) edges opposite the working edge. The identification of this category of tools as saws might be misleading, since the working edges were characteristically straight rather than denticulated and the actual use of the tools was for cutting and grooving rather than sawing.

Hayden (1979a:11) also remarks that chopping tools were the most distinctive group of Aboriginal tools, because of their large size characteristics. Listed below are the mean size data on the four Western Desert tool categories as observed by Hayden (1979a:51-123) during his technological projects fieldwork. These values are derived from data reported for individual tools.

Size (mm)	Chopping Implements	Adzes	Hand-Held Shaving Tools	Saws
n of cases	30	57	18	8
\bar{x} length/range	118.10/85-164	33.72/23-57	52.70/27-77	62.25/40-92
\bar{x} width/range	111.90/72-275	29.53/19-50	46.61/27-79	51.13/27-68
\bar{x} thickness/range	53.90/25-85	11.72/6-22	18.00/7-33	20.00/8-30

As can be seen the chopping implements are indeed very distinctive from the other categories with very little overlap exhibited in the ranges. There is a great deal of overlap between the other tool categories however.

Examination of edge angle data (Hayden 1979a:124-126) for the three smaller tool categories does not provide the criteria needed to class these tools on morphological grounds either. Adzes peak at an edge angle of 70° to 75°. This appears to occur as a result of the high incidence of resharpening in adzes. However, edge angles principally range from around 43° to 97°. Hand-held shaving tools show more variation, but also tend to cluster in the higher edge angles (e.g., 75° to 90°), especially retouched tools. They range from around 33° to 97°.

Saws tend to cluster at lower edge angles with a mode of about 50°. The range of saw edge angles (23° to 87°), however, still exhibits a great deal of overlap with the other two categories.

Although the assemblage of the Western Desert Aborigines are not strictly analogous to assemblages in the North Carolina Piedmont, there are a number of observations made by Hayden which should generally apply to the characteristics of situational gear. Based on such modern observations it seems inappropriate to make elaborate morphological distinctions between items of situational gear. Use categories would be better defined by detailed microscopic use-wear analysis. Without such analysis it is undoubtedly more prudent to keep classificatory principles simple.

BIFACE REDUCTION AND MAINTENANCE STRATEGIES

It is becoming increasingly apparent to students of lithic technology (eg. Isaac 1977:116-142, Keeley 1980:161; Callahan 1979:63; Frison and Bradley 1980:18-45; Binford n.d.) that bifaces represent an extremely variable class. Isaac (1977:120), for

example, has devised an elaborate scheme of morphological variation in the Olorgesailie Acheulean biface assemblage consisting of classic and subclassic hand axes, picklike handaxes, knives, chisel-ended hand axes, cleavers, irregular ovate and subdiscoid hand axes, choppers, picks, triedres and corelike bifaces. Each of these categories is assumed by Isaac to be a discrete class of items intentionally manufactured for a defined range of activities.

However, Keely (1980:161) and Binford (n.d.:17) allude to an entirely different conceptual framework for viewing such variability. As discussed previously, they view this artifact class as an immensely complex, integrated system exhibiting variable uses ranging from butchering to flake production.

Diversity of form and use for bifacial tools can ultimately be attributed to the unique curational strategies bifaces are intended to implement. As a core, a biface constitutes a regularized and easily portable form in contrast to the bulky and awkward morphologies of other, more expedient core types. On the other hand, it provides flexibility and control over flake types produced for specific situational tasks that cannot be achieved by strategies where raw material is transported in the form of previously manufactured flake blanks. The ultimate outcome of this flexibility is increased raw material conservation, since some activities would require only very thin flakes as opposed to the thicker, more massive option provided by flake blanks which are not well suited as tertiary flake producers themselves. In addition, the necessary precautions for protecting flake blanks from breakage during transport are not necessary when raw material is transported in the more cohesive and stable form of a biface. The uniformity and regularity which are biproducts of bifacial flake production (or biface reduction) creates a form suitable for a number of different activities including cutting and chopping during butchering (i.e. Frison 1978:140-141; Frison 1979:262-263; Keeley 1980:160-161), scraping during butchering (i.e. Binford n.d.:17; Frison and Bradley 1980:20), wood axing and adzing (i.e. Goodyear 1975:39-42; Morse and Goodyear 1973; Semenov 1964:122-128) and perhaps axing in butchering (i.e. Semenov 1964:125). As the radius of a core is reduced, bifaces becomes less appropriate for these heavy duty uses, but in the process they become more suitable for lighter uses such as a meat and vegetable cutting or scraping.

Despite these changing perceptions concerning the role of bifaces within the organization of technologies, recent attempts at classification have produced schemes which are aligned to more traditional approaches. Classes are devised to reflect perceived functional differences and are viewed as discrete clusters of tools manufactured for specific uses. If credence can be placed in the model presented above, however, variability in biface assemblages should predominantly reflect the life-history or core reduction stage and the discard context of the last use of individual bifaces. Thus, the discard condition of an individual biface should represent a stage of a complicated life-history trajectory, within a general biface curation system which stresses high situational responsiveness.

An excellent example of a biface classification system which attempts to accommodate this complicated trajectory is that presented by Frison and Bradley (1980:19-45) for the Folsom assemblage from the Hanson Site, Wyoming. In fact the authors call this classification a "Complex Reduction System" (Frison and Bradley 1980:31). The defined reduction sequence contains seven categories of bifaces, all of which are considered to have been "produced as cores and/or implements" (Frison and Bradley 1980). These categories reflect a sequence of increased finer shaping, with the first representing initial reduction and subsequent categories indicating progressively later stages.

One problem with the system is that the authors persist in orienting the classification as a sequence of *manufacturing* stages leading to the *production* of a biface. This perspective is slightly different from the situationally responsive life-history trajectory we propose. In this instance the authors are implying that the biface was the intended end product of an immediate manufacturing effort in the traditional sense of a biface thinning sequence. What we are arguing, however, is that although the biface is a desired end product, the reduction sequence is delayed and interrupted by situational contingencies which arise in the operation of a subsistence-settlement system. The reduction sequence is protracted and is characterized by two concerns: 1) production of flakes and 2) maintenance of symmetry to conserve the mass of the core and also insure its suitability as a tool when the situation dictates. Thus, the end product is not seen as the desired tool of a manufacturing episode, but as the logical consequence of the successful completion of a life-history trajectory.

Elements of Frison's and Bradley's (1980:19-45) analysis would tend to support this view. First, the possible functional integration of the Hanson site discoidal cores and bifaces has been examined. One of these discoids has been typologically identified as a "hand ax" because one edge has been bifacially trimmed along the margins at one end (Frison and Bradley 1980:20).

Overlapping characteristics of these two core forms provide strong evidence that they represent stages in one flake producing strategy rather than two different strategies, as the authors contend. A dissenting view would point to the demonstrated differences in flake morphology produced by the two core forms. However, this could just as easily be explained as a function of early stage versus late stage flake production dynamics. Early stage cores, which logically are larger, would provide the appropriate mass for removing the larger, thicker flakes which are reflected in the flake scar patterns on discoids. Such a strategy may be necessary to sufficiently thin a core to a level where it can successively be used for bifacial flake production. As core mass is reduced, constraints on flake production increase if the breadth of the core is to be conserved. Conserving the breadth of the core accomplishes two things: 1) it allows for the production of wide flakes and 2) conserves the life of the core which in turn maintains the "tool" qualities for longer periods. The end

result of this sequence is to move the point of percussion from the invasive zone of the core (in the case of discoid flake production) to the margins (as in bifacial flake production). This could explain the authors' observations about the tendency for discoids "to finish with marginally struck flakes" (Frison and Bradley 1980).

The crux of the matter, though, is whether bifaces have a protracted or immediate reduction history. This is a very complex question and it is quite possible that both reduction histories are possible within a single flake production strategy depending on the situational variables. It is also possible that many bifaces were immediately manufactured from small flake blanks totally independent of bifacial flake production strategies. Flakes produced from this process could easily be used despite the fact that they were not the primary intended product. Frison and Bradley (1980:21) were unable to distinguish primary versus secondary product relationships between the Hanson site bifaces and the utilized flakes of bifacial retouch. However, out of the 49 individual bifaces represented by 58 fragments, only 9 showed evidence of use along the margins. The authors (Frison and Bradley 1980:22) concluded from this "that the Hanson bifaces in some circumstances were intended for use and in other circumstances may be primary cores."

The fact that only broken bifaces were recovered from the Hanson site excavations suggests that this form had to be whole to merit curation. It is also apparent that the fragments had a low use rate since only 9 exhibit primary marginal use and the fragments composing these bifaces and four others show evidence of secondary scraper or grooving use along their steep fracture planes (Frison and Bradley 1980:96-97). This would indicate that bifaces were functionally important only as whole objects. Upon breakage they were either discarded or used in a secondary manner as situational gear. Since Frison and Bradley (1980:43) conclude that none of these bifaces "were intended to be made into projectile points," the possibility that this phenomenon can be explained as a result of preform discard can be ruled out. Unless these items required hafting, it is also difficult to envision what task would require a whole biface instead of a broken one. In relation to this, Frison (1974, 1979) has commented that a popular butchering technique on the High Plains during the Holocene involved bone choppers, which might obviate the use of stone axes in butchering contexts such as the Hanson site. This is by no means certain however, as there is also much variation exhibited in Plains butchering techniques (Frison 1979:261). The strategic flake-producing properties of bifaces may relate to this phenomenon. The radial preverse and bend breaks which typify the biface assemblage (Frison and Bradley 1980:43-44) would serve to severely limit the flake producing capabilities of a core by removing a good portion of the margin (platform) and restricting the area over which a flake could carry. In a highly mobile subsistence-settlement system such as that postulated for Paleo-Indian Folsom hunters (see Frison 1974), whole bifaces should have been selected over fragments for transport in response to these flake-producing concerns.

Bifacial or radial cores can occupy a very pivotal place in the organization of lithic technologies because of their multi-use nature. The wide use of large bifaces as tools as well as raw material sources has long been recognized by Old World archeologists. Keeley (1980:161) has described some advantages:

The retouched edge of a hand ax may provide a sturdy, resharpenable cutting edge with a variety of edge angles; its weight and compact form make it useable as a chopper and hammer (signs of heavy battering on one side of the heavy butt is not an uncommon feature of larger hand-axes), the point on some types of hand axes renders them useful both for stabbing and for more delicate tasks like boring or prying; while, if the implement is large enough, the hand ax can even serve as a core from which flakes providing additional cutting edges can be struck. To provide for all these tasks with flakes, one would need to carry an inconvenient number of them of various sizes, shapes, and edge angles, plus, perhaps a core and hammerstone — not a very handy assortment to carry on the chase.

Thus, unlike the more expedient flake cores (i.e. uni- or multidirectional cores) which are generally discarded immediately after the production of flakes, radial cores are portable and can be used for a number of other activities as well. In effect radial cores can be viewed as a curated item which can serve not only as a source of raw material, but also as a multiple use tool.

Binford's (n.d.:17) interviews with Eskimo informants suggests a similar functional significance of radial cores:

Informants always spoke of carrying 'cores' into the field, as they put it, you carry a piece that has not been worked so much that you cannot do different things with it. These cores were described as shaped like discs of different sizes, the only items pictured in the books which I had at Anaktuvuk for comparative purposes that were identified as like the 'cores' their father carried were the 'discoidals' pictured by Giddings (1964 Plate 56). That the items being described by the informants were in fact cores was made clear by many references to the removal of flakes radially around the disc for use in butchering animals.

Scraper flakes were characteristically removed from the longer side of the oval core. When the core was reduced to a small size, it was used as a scraping tool (Binford n.d.).

The major Folsom flake production strategies reported by Frison and Bradley (1980: 18-30) at the Hanson site similarly involved discoidal core and biface reduction. The primary difference between these two strategies is in the method of flake removal. In the

case of radial core reduction, percussive blows are delivered to "nonmarginal areas of a bifacial core" (Frison and Bradley 1980:18). Flake scars tend to be large and deep, producing a crude-looking discoidal biface with a broad, sinuous edge. Flakes produced by this strategy are characteristically thick and exhibit wide platforms. Bifacial reduction entails the detachment of flakes from the margin of a bifacial core. The resultant flakes are generally curved in cross section, exhibit unidirectional or bidirectional flake scar patterns on their dorsal faces, and have relatively narrow, lipped platforms (Frison and Bradley 1980:24).

These two distinct reduction strategies provide evidence to suggest that they may be functionally related. Discoidal cores sometimes exhibit evidence of specialized flake removal along the long axis of the core resulting in substantial thinning. This type of flake must be removed from the margin of the core rather than from one of the faces to carry such a distance. In final core reduction the decreased thickness of the core dictates that thinner flakes are removed. One option at this point would be to detach flakes from the margin of the discoid rather than from a face. Such an action could easily lead to the bifacial reduction strategy described by the authors. Obviously the major flake producing strategy is bifacial regardless of core type, and the described variability in form may simply reflect differing needs for specific activities, but emphasizes the flexibility of certain prehistoric lithic reduction systems.

This consideration of the role of bifaces in flake production is corollary to discussions about curation of endscrapers. First there appears to be a shift in the strategy of curation for these tools from the Early Archaic Palmer I to the Palmer II occupation at 31Ch29. Although their uses are identical the Palmer II sample exhibits a decreased number of retouched lateral edges. Morphology of the tools changes to broader, thinner forms. Palmer I endscrapers are characteristically thick and appear to derive primarily from prismatic flake blanks, although some were manufactured from bifacial core flakes. The Palmer II occupation endscrapers are predominately fashioned from bifacial reduction flakes and are more expediently shaped. This would indicate that endscrapers from the Palmer I floor were curated and transported in the form of tools; higher edge angle at discard suggests greater maintenance. Furthermore, the greater thickness of the bits would increase the scraper's use-life by increasing the surface area available for resharpening. By contrast, Palmer II endscrapers were expediently manufactured, and were curated and transported in the form of bifacial cores. The lower discard edge angle, thinner bits and infrequent lateral shaping suggests that these tools were not as intensively maintained as the Palmer I sample and may have been discarded after a single use episode.

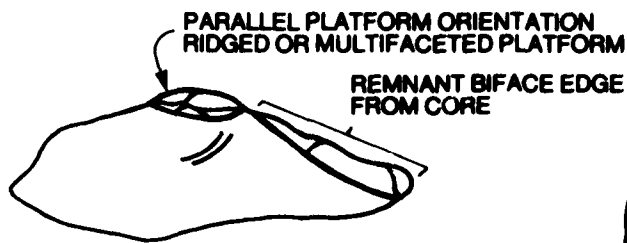
This evidence argues for a decreased reliance on endscrapers in the Palmer II technological organization. In a sense this evidence indicates that these tools, although they were used for the same activity, were changing from an anticipatory element of personal gear to a situational status. This would imply that hide scraping, as a specific activity class, was becoming less predictable in its occurrence, and that the effort of high maintenance was becoming less justifiable within the strategic organization of the system.

In constructing a classification system for the Haw River biface assemblage, we have adopted an approach that could address the protracted life-history trajectory discussed above. This was deemed justifiable because of the noticeably large proportion of modified and utilized biface flakes found in the assemblage. Thus, bifaces are viewed as flake producing implements as well as tools, their life-histories being viewed as a series of reduction episodes instead of manufacturing reduction sequences primarily intended to immediately produce a bifacial tool (Muto 1971; Callahan 1980). This does not imply, however, that bifaces cannot be immediately manufactured within this system. It is undeniable that many bifacial tools are manufactured from thin flake blanks which could not have been used for flake production themselves. The rates of reduction and the time between episodes of reduction, however, should vary with the functional character and situational conditions of an occupation.

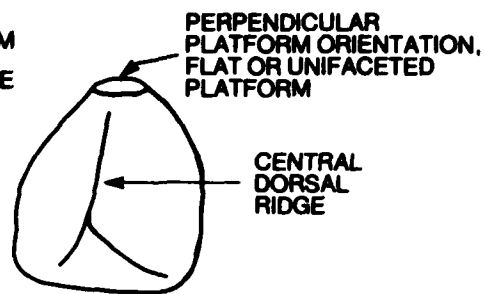
To summarize this discussion, technologies typified by discoidal/biface flake production contain biface assemblages reflective of complex life-histories. Discarded bifaces within such technologies should result from two basic manufacturing strategies. One strategy involves immediate manufacture from thin flake blanks. The other strategy represents protracted life-history stages of biface core reduction. A distinguishing characteristic between these two strategies should be biface thickness. Bifaces used as flake producing cores should maintain greatly thicker masses. However, in the later life stages of this system size differentiation between the two strategies should be less distinct.

Throughout the occupation sequence at 31Ch29 the predominant flake production system is represented by biface reduction strategies. This is illustrated most clearly in the technological attributes of flake blanks used for the manufacture of flake tools. The principal kinds of flakes (see Figure 9.1) derived from this system are: 1) prismatic flakes (PF); 2) discoidal core flakes (DCF); 3) typical flakes of bifacial retouch (FBR); 4) central ridged flakes of bifacial retouch (CRFBR); and 5) side-struck bifacial core reduction flakes (SSBCR). Prismatic flakes are relatively thick flakes with narrow biconvex striking platforms which usually show a single central arris or two parallel ridges on the dorsal surface. The ventral surface is generally flat. Prismatic flakes were commonly produced as blanks for endscrapers. Discoidal core flakes correspond to Frison's and Bradley's (1980:18) definition: "[discoidal core flakes] have thick, wide platforms, a simple flake scar pattern, low flake scar counts, and a triangular longitudinal cross section." Typical flakes of bifacial retouch in the assemblages conform to House and Ballenger's (1976:89-90) definition of biface thinning flakes:

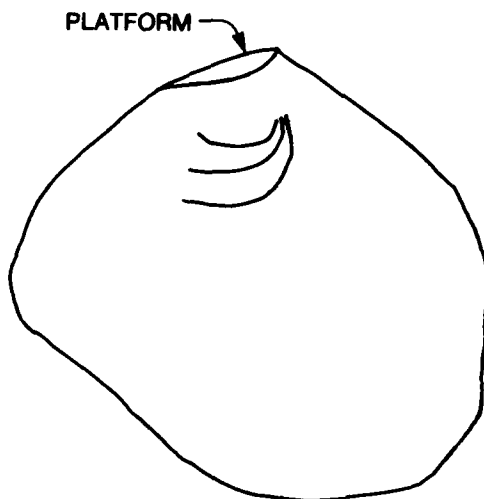
These flakes are assumed to have been removed during the process of thinning or resharpening bifaces. They are relatively flat, have broad, shallow flake scars (from detachment of previous thinning flakes) on the dorsal face, and tend to exhibit "feathering-out" of lateral margins. When the platform is present, it usually exhibits a high angle and/or crushing and grinding.



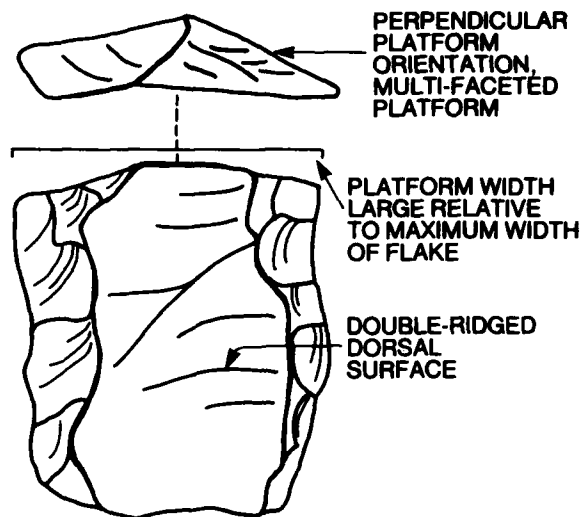
SIDE-STRUCK FLAKE



PRISMATIC FLAKE

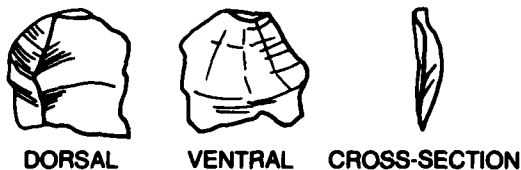


LARGE FLAKE BLANKS



DISCOIDAL CORE FLAKE*

*FROM FRISON AND BRADLEY 1980,
FIGURE 8, PAGE 21.



BIFACE THINNING FLAKE*

*FROM HOUSE AND BALLENGER 1976,
FIGURE 15, PAGE 90.

Central-ridged flakes of bifacial retouch are a special kind of FBR exhibiting a single ridge on the dorsal surface. These flakes generally carry across most of the width of a biface and approximate blade-like dimensions. Side-struck bifacial core reduction flakes characteristically exhibit platforms oriented perpendicularly to the long axis. The flake was detached from the core by an invasive blow to a bifacial core, which produced a blank with an apparent bifacially retouched edge in association with the striking platform. The long axis of this kind of blank is generally perpendicular to the axis of percussion. Excellent examples of side-struck flakes are represented by the blanks from Feature 22 (see Plate 18, Chapter 9).

The details of blank selection will be discussed further in the flake tool descriptions that follow in the next chapter. For our purposes it is sufficient to note that biface/discoid core reduction was the basic flake production strategy evinced in the full range of occupations at 31Ch29. This principle, therefore, will be the basis for the biface classification presented in the following chapter.

To synthesize the advantages of the bifacial tool/core it can be said that it is situationally responsive. By expending a good deal of maintenance effort in retaining a symmetrical form, bifaces function as efficient sources of raw material. Simply adjusting the location of the percussive blow to either the biface edge or the invasive zone during flake production allows for flexibility and control over the kinds of flakes produced for an intended purpose. This same curatorial effort to maintain symmetry simultaneously makes the biface a viable tool for a vast array of uses as well. Thus, in contrast to tools which are designed and curated to respond to a narrow range of anticipated uses, such as projectile points or endscrapers, bifaces were designed and curated in a manner which emphasized extreme flexibility in usage.

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